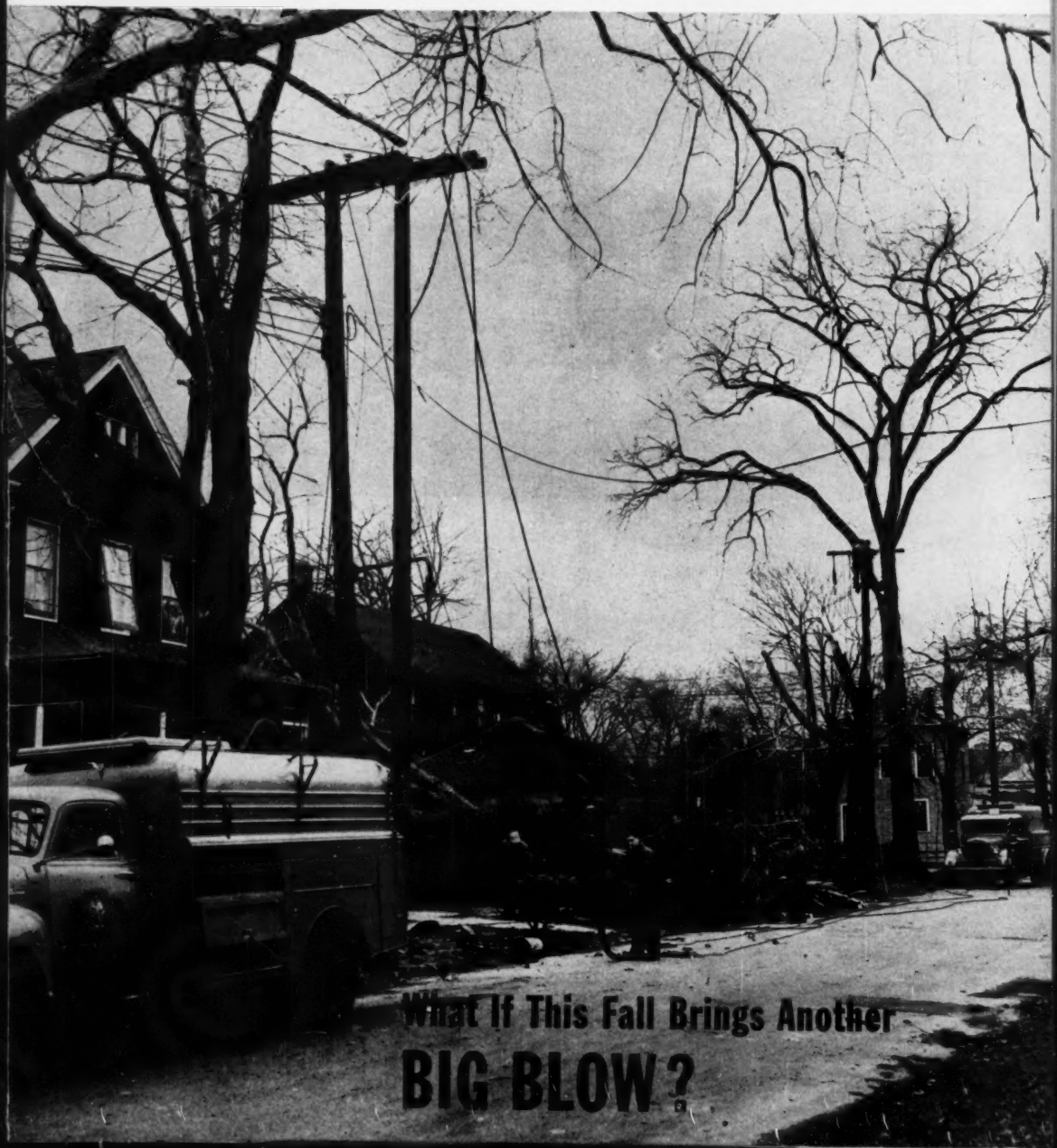
NOVEMBER 5, 1951

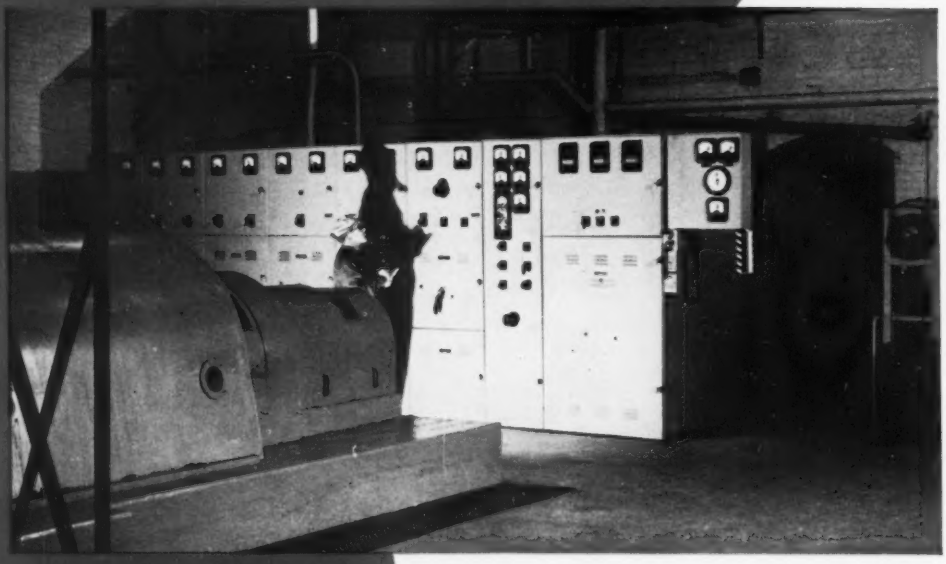
Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



PREVENT HARMFUL RUST, SLUDGE AND FOAM...



Use the turbine oil with "added" protection TEXACO REGAL OIL (R&O)

Lubricate your turbines with *Texaco Regal Oil (R&O)* and enjoy an extra margin of safety. Here's one of the world's most famous turbine oils—*Texaco Regal Oil—improved* with special Texaco additives and special Texaco processing to make it *more than ten times as resistant to oxidation* as ordinary turbine oils, and vastly more effective in preventing rust, sludge and foam.

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TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

THE JOPPA LINE

You'd have a hard time finding a better example of the tremendous production power of free enterprise than the Joppa Line.

The Kentucky Area Project of the Atomic Energy Commission needed 200,000 kw in a hurry—needed it before a steam plant could be built to produce it.

Three companies pooled their resources to build a 136 mile, 230-kv transmission line to meet the need. They are Union Electric Co, Central Illinois Public Service Co, and Illinois Power Co—three of the five companies that teamed up to form Electric Energy, Inc, which is building the 500,000-kw steam plant to serve AEC's load. When this station is completed the new 230-kv line will tie the systems of these companies together and will tie the new plant into these systems.

The story of this project, as told by D. P. Ayers, of Sverdrup & Parcel, Inc, consultants on the job, is in this issue of Electrical World. We think you'll find it of more than routine interest as a fine example of free enterprise teaming up to do a job of fearful importance.

Like the story of the Joppa Station in Electrical World for November 5, this story is an EW exclusive, reported at the design stage.

Also, it's one of the few lines of this length and voltage built almost entirely with wood poles, and wood was used everywhere possible to save both steel and time.

HIGHER DISTRIBUTION VOLTAGE

There seem to be plenty of "major" problems facing the operating utility companies today, and one of them involves raising distribution voltage when bigger load demands must be met.

The problem is made more vexing by shortages of many critical materials.

Southern California Edison studied its entire system when considering an increase in distribution voltage, and came up with a detailed plan for load growth on a district area basis. The story of this study, how it was made, and what conclusions were reached is told in Electrical World for November 19 by George A. Davis of Southern California Edison's System Planning Division.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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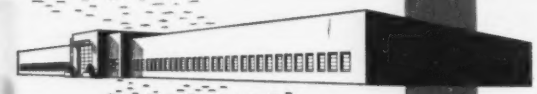
long lived

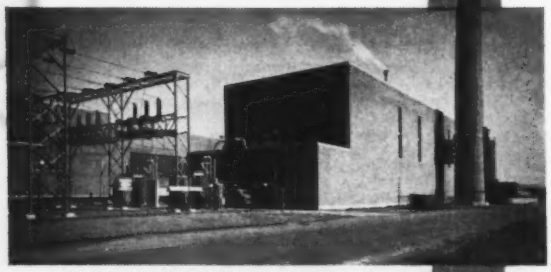
KEYSTONE-HAZAPRENE CABLES

selected for: UNDERGROUND PRIMARY CIRCUITS | CONTROL CIRCUITS

at YALE & TOWNE'S new Philadelphia Plant



From this 34.5 KV substation, Keystone-Hazaprene 5 KV Cables serve as underground primaries carrying the 2400 volt, 3 phase current to the main switchboard in the boilerhouse.



Keystone-Hazaprene 600 volt control cables operate from the switchboard in this boilerhouse, underground to the 4 substations that supply current to the equipment manufacturing famous Yale and Towne lift trucks and machine tools.

An excellent example of modern design and construction, the new Yale and Towne Plant in Philadelphia is typical of current industrial building... here you'll find Keystone-Hazaprene Cables. Like new plants, cables are an investment, and Keystone-Hazaprene pays off with the premium performance and long, maintenance-free service that means long term economy.

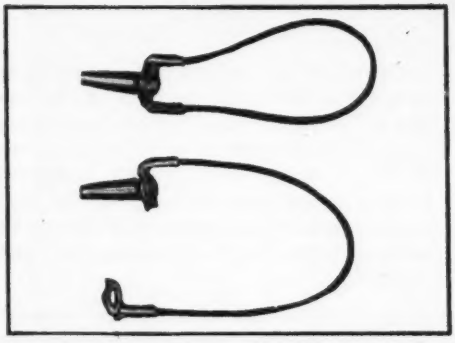
For high voltage circuits, Hazard's Keystone Insulation effectively combines in one oil-base compound remarkable resistance to ozone, heat, and moisture. Protected with a Hazaprene sheath—a tough Hazard-developed neoprene compound that resists abrasion, oil, moisture and chemicals—Keystone-Hazaprene Cable assures the long, reliable service that reduces operating costs.

In planning new plants or circuit expansion, you'll find Hazard's engineering staff helpful in selecting proper wires and cables. Over 50 years of manufacturing and service experience provides a solid background of research-tested, field-proven data covering every type of installation. This assistance is available without obligation. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable



THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

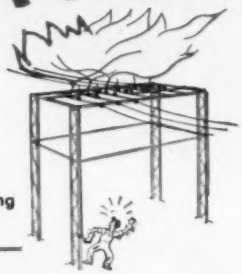
WRITE FOR NEW BULLETINS FOR FULL INFORMATION

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

POWERLITE DEVICES, LTD., TORONTO

Alduti INTERRUPTER SWITCHES



① Where Horn Gap Switches Are Inadequate

because horn gaps cannot, under all conditions, safely break magnetizing or charging currents; nor can they interrupt load currents

② Where Circuit Breakers Are Too Expensive

for non-automatic switching and short circuit protection

ALDUTI INTERRUPTER SWITCHES

offer a proved and economical solution to such application problems.

Ten years of operating experience in thousands of installations, and many field trials under severe test conditions, have demonstrated the ability of these Interrupter Switches to — safely and repeatedly —

- Sectionalize either radial or loop distribution and subtransmission circuits, under either load or charging current conditions . . .
- Switch load and magnetizing currents of transformer banks . . .
- Switch charging currents of capacitor banks.

And because there is NO EXTERNAL ARCING during the operation of Alduti Interrupter Switches: they need not be mounted horizontally upright, but can be mounted vertically, or underhung; hook stick operation can be employed where economy dictates; and phase spacings can be reduced to 18 inches for the 7,500-volt and 33 inches for the 34,500-volt switches. Hence structures can be smaller, connections simpler, and construction cost can be reduced below that of installing horn gap switches.

Also, Alduti Interrupter Switches can be metal-clad, thus providing—even for subtransmission applications — enclosed "packaged-type" switches, thereby permitting the complete enclosure of all components of a substation.

When combined with S&C Power Fuses, Alduti Fused Interrupters also provide short circuit protection with fault current interrupting ability up to 40,000 amperes asymmetrical, thus making possible the elimination of expensive circuit breakers where automatic switching is not required.

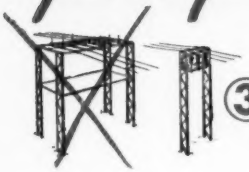
Alduti Interrupter Switches are supplied in these ratings:

Volts	Continuous Amperes	Interrupting Amperes, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

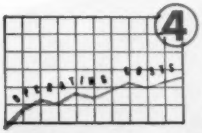
Formerly SCHWEITZER & CONRAD, INC. In Canada, Powerlite Devices, Limited, Toronto

give you Great Advantages:



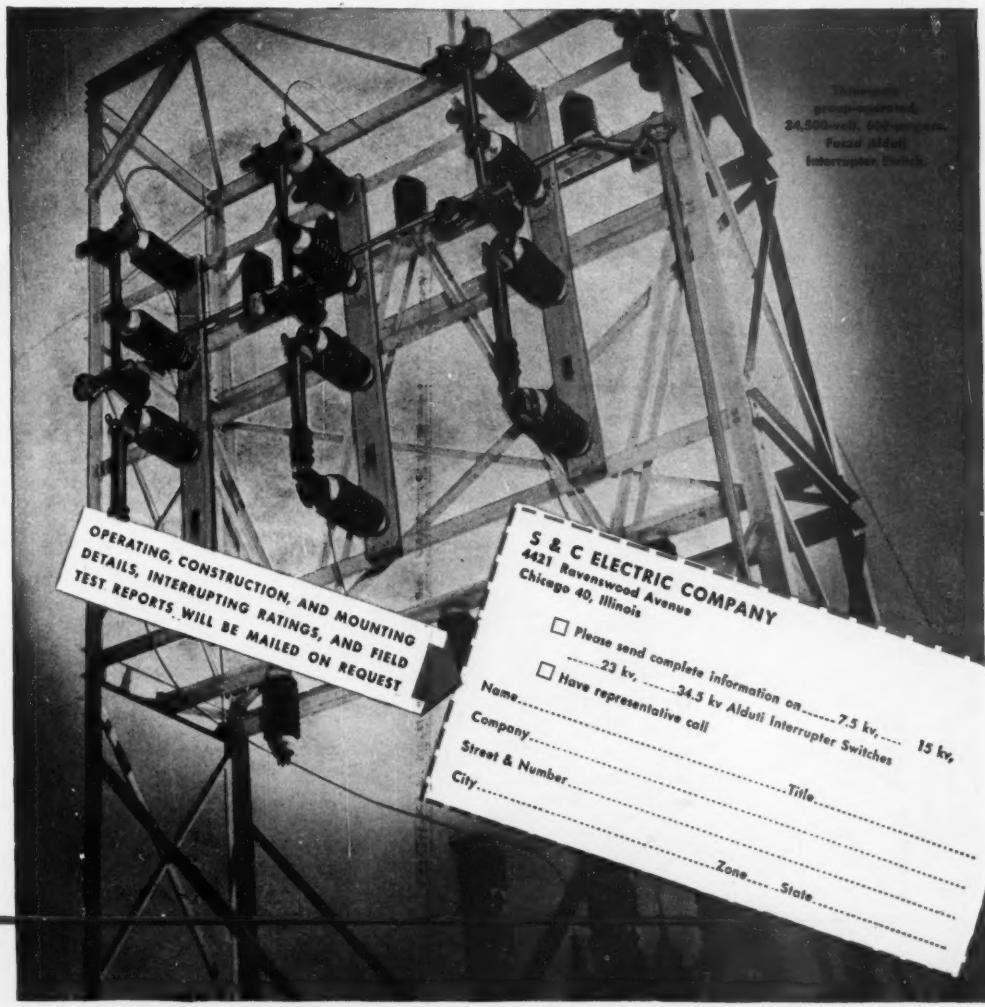
③ Where Structure Design Is Restricted

because horn gap switches can be mounted only in the horizontal upright position, and need wide phase spacings



④ Where Switching Sequences Are Complicated And Costly

because multiple operations—involving breakers, disconnects, and operating personnel— are required to isolate equipment or sectionalize circuits



OPERATING, CONSTRUCTION, AND MOUNTING DETAILS, INTERRUPTING RATINGS, AND FIELD TEST REPORTS WILL BE MAILED ON REQUEST

S & C ELECTRIC COMPANY
4421 Ravenswood Avenue
Chicago 40, Illinois

☐ Please send complete information on ..... 7.5 kv, ... 15 kv, ... 23 kv, ... 34.5 kv Alduti Interrupter Switches

☐ Have representative call

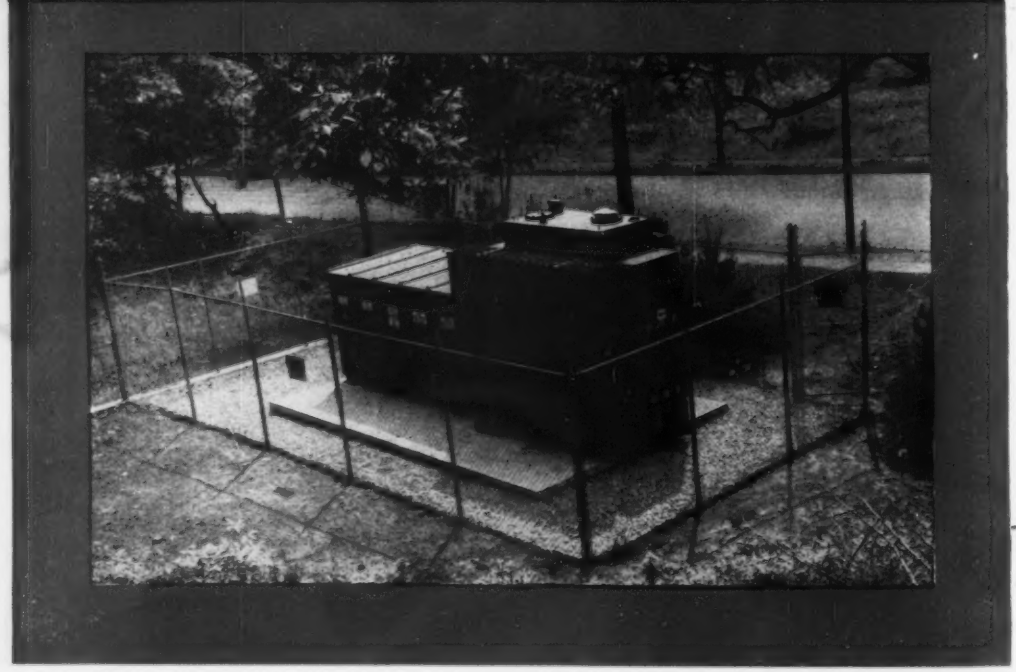
Name ..... Title .....

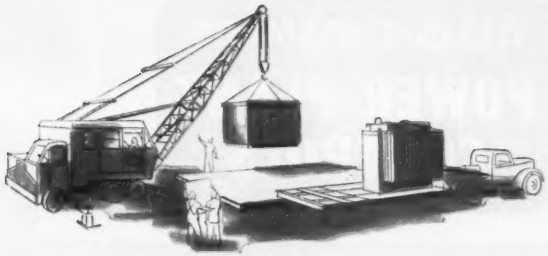
Company .....

Street & Number .....

City ..... Zone ..... State .....

FORT HILL
17
13 KV
GROUND SW
INERTAIRE
CONTROL





Consolidated Edison installs another Westinghouse Unit Substation . . .

for lower, long-range distribution costs!

Con Edison's expansion program aims at *long-range* distribution economy. That's why —wherever possible—they utilize modern unit substations. And what they have to say about a recent Westinghouse installation indicates how conveniently they—*and you*—can attain this objective.

"Its compact, factory-assembled design enabled us to immediately realize savings in real estate costs, in preparation of the installation site and in the actual installation itself. Also, it is contributing to better electrical service by improving voltage conditions. Most important, its flexibility and low-cost maintenance features will enable us to *economically maintain* high standards of service in an area where considerable load growth is anticipated."

Con Edison enjoys these benefits because Westinghouse Unit Substations are specifically designed to meet today's power distribution problems. "Unitized" construction enables you to add "blocks of power" to accommodate increased load requirements. And they're available in types to serve the most modern distribution systems.

For complete information, get your copy of Booklet B-4061. Ask your Westinghouse Representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60758

YOU CAN BE SURE... IF IT'S Westinghouse

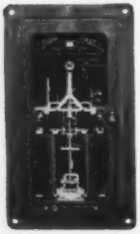
UNIT SUBSTATIONS

ALLIS-CHALMERS POWER PLANT CONTROLS

7 Keys

1 SYNCHRONIZING MACHINES

Automatic synchronization of generators, synchronous condensers and tie lines, no matter how large, is the job done smoothly, quickly and unerringly by the *Synchro-Operator*. Just turn a control switch and it takes over — indicates relative speed and phase angle . . anticipates time for circuit breakers to close.



The *Synchro-Operator* is absolutely safe and eliminates the danger of manual synchronizing errors. It automatically brings the incoming machine into step with the line and closes the generator breaker at exact synchronism. With the *Synchro-Operator*, it's possible to synchronize from a remote point.

2 ORDER TELEGRAPH SYSTEMS

The Allis-Chalmers Order Telegraph System is accurate and reliable. Sending and receiving orders is accomplished on one dial — saves valuable switchboard space — aids operating personnel. Receipt of each message is assured by an alarm system which operates until the order is returned correctly.

The many uses of Allis-Chalmers dc Positioning Devices include control and indication of remote valves in hydro plants, transmission of orders between switchboard and turbine room, gate position indication and control, water level indication, and hydraulic turbine governor control. Select either a five or ten-inch semiflush dial.

5 ROCKING CONTACT VOLTAGE REGULATORS

Rocking Contact Voltage Regulators have established long records of dependability. "Not one dollar spent for maintenance in fifteen years of continuous service," is typical experience.

Designed for panel mounting, this regulator makes a neat installation on any switchboard. Regulation is achieved by rocking a carbon-rimmed sector over a silver-plated stationary commutator to control the amount of resistance in the exciter shunt field.

When selecting generator voltage regulators, remember that Allis-Chalmers builds both mechanical and rotating types . . ; makes recommendations based on your requirements.

6 STARTING AUXILIARY MOTORS

There is an Allis-Chalmers starter for every motor need . . . full or reduced voltage; for synchronous, wound-rotor or squirrel-cage motors.

Choose Type H Starters for 2300-5000 volt motors. They are engineered to your application — offer complete protection to personnel and equipment through compartmented cubicles, current limiting fuses, overload, undervoltage, interlocking and other devices.

For 110-550 volt motors, sizes 0 to 7 starters cover the range from fractional to 600 hp. Select from a variety of enclosures and operating arrangements to fit your needs.

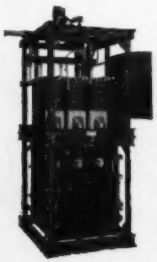
Synchro-Operator, Regulex and Rocking Contact are Allis-Chalmers trademarks.

ALLIS-CHALMERS

to Dependable Power

3 BOILER DRAFT FAN SPEED CONTROL

Draft fans operate at exactly the speed your boilers require for perfect combustion when Allis-Chalmers Type 257 Liquid Rheostats are used with wound-rotor drive motors. The right draft for any combustion condition is provided automatically by the wide range stepless speed control.

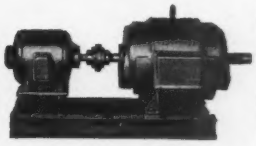


They have few moving parts, no arcing contacts, no mechanical connections to either fan or motor. Not only is the Allis-Chalmers Liquid Rheostat compact in size, but it can be placed in any convenient location — doesn't have to be adjacent to the motor it controls.

4 *REGULEX* VOLTAGE REGULATORS

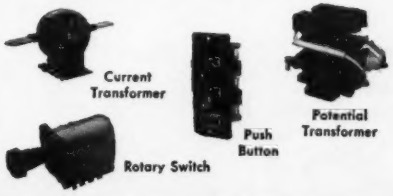
The *Regulex* Voltage Regulator is the most modern method of controlling voltage on large generators. *Regulex* Control eliminates the pilot exciter . . . has no vibrating or moving contacts.

High amplification and fast response of the *Regulex* Generator Voltage Regulator on system disturbances causes the generator field current to reach the required value for stability at the new load rapidly—thereby decreasing the possibility of the generator pulling out of synchronism . . . improving system stability and giving better regulation under all system conditions.



7 CONTROL BOARD AND SWITCHGEAR DEVICES

Allis-Chalmers switchgear devices include rotary control switches, pushbutton stations, current and potential transformers, disconnecting switches, indicating lamps, terminal boards, thermal relays, oil and air contactors, oil and air circuit breakers. All are designed and built to the high standards of reliability associated with the name Allis-Chalmers in power plant equipment.



SEND FOR MORE INFORMATION

These seven key power plant control devices are described more fully in bulletins and leaflets. Check off those you'd like to have on the coupon below and give it to your A-C representative, or send it to Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS Milwaukee 1, Wisconsin

Send me the leaflets and bulletins checked below:

- ☐ *Synchro-Operator*.....14563868
- ☐ dc Positioner.....14B6641
- ☐ Liquid Rheostat.....1457544
- ☐ *Regulex* Voltage Regulator
  Rocking Contact Regulator
  - ☐ for small machines.....14B6035
  - ☐ for larger units.....14B6015
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- Starters
  - ☐ Type H.....14B6410
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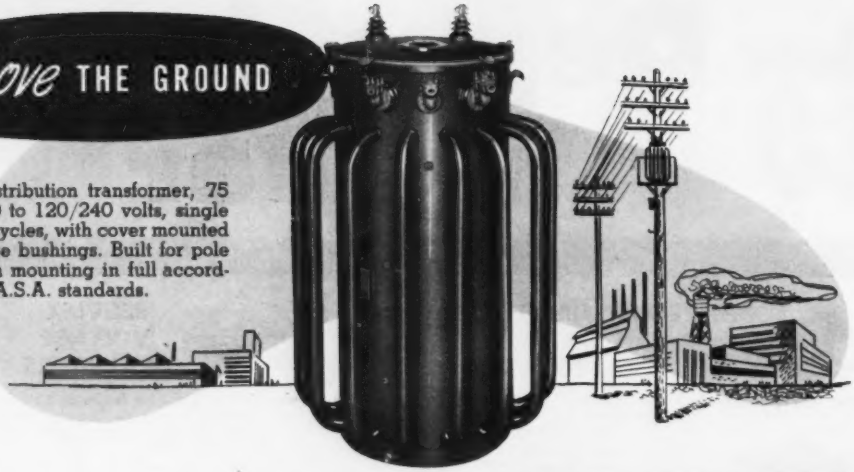
A-C ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

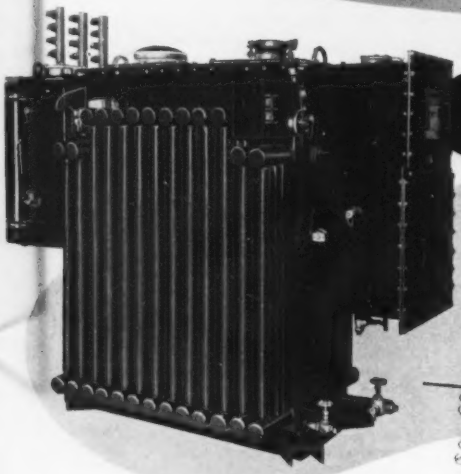
Above THE GROUND

Type A distribution transformer, 75 KVA, 2400 to 120/240 volts, single phase, 60 cycles, with cover mounted high voltage bushings. Built for pole or crossarm mounting in full accordance with A.S.A. standards.



Standard

TRADE MARK



Under THE GROUND

Type HTS Askarel subway type network transformer, 500 KVA, 12,470 to 216Y/125 volts, 3 phase, 60 cycles, complete with high voltage disconnect and grounding switch, low voltage network protector, and electrical interlocks.

Transformers FOR EVERY APPLICATION

Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)

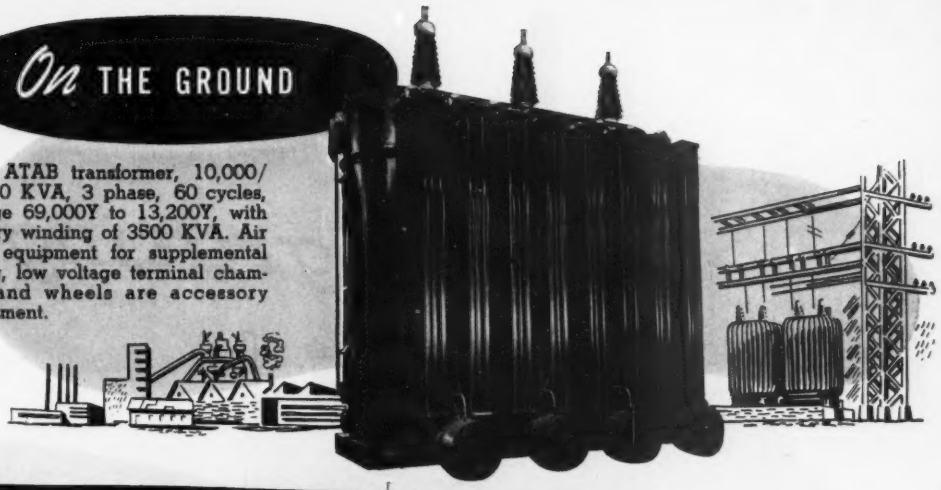
Instrument transformers (for use on circuits up to 72,000 volts, inc.)

Dry type (up to 1000 KVA and max. voltage ratings of 4800.)

Control transformers (compound filled or open type.)

On THE GROUND

Type ATAB transformer, 10,000/12,500 KVA, 3 phase, 60 cycles, voltage 69,000Y to 13,200Y, with tertiary winding of 3500 KVA. Air blast equipment for supplemental rating, low voltage terminal chamber and wheels are accessory equipment.



TRANSFORMERS AT EVERY LEVEL

Installed on thousands of poles throughout the electrical distribution system. On the ground stepping-up or stepping-down at substations. Underground at network load centers. You find STANDARD transformers operating at every level because . . .

. . . users of electrical equipment, having learned through actual experience, place their confidence in the transformers that are built "right" from the ground up. Designed by topflight engineers, constructed by craftsmen who know the importance of following instructions to the letter, then . . .

. . . tested by STANDARD, a recognized leader in the manufacture of Testing transformers. Thus possible future trouble spots are located and eliminated before the transformer leaves the factory. Fully protected from the ravages of dust, dirt, fumes and dampness. Rugged construction allows STANDARD transformers to be used anywhere. Next time remember . . . STANDARD TRANSFORMERS.

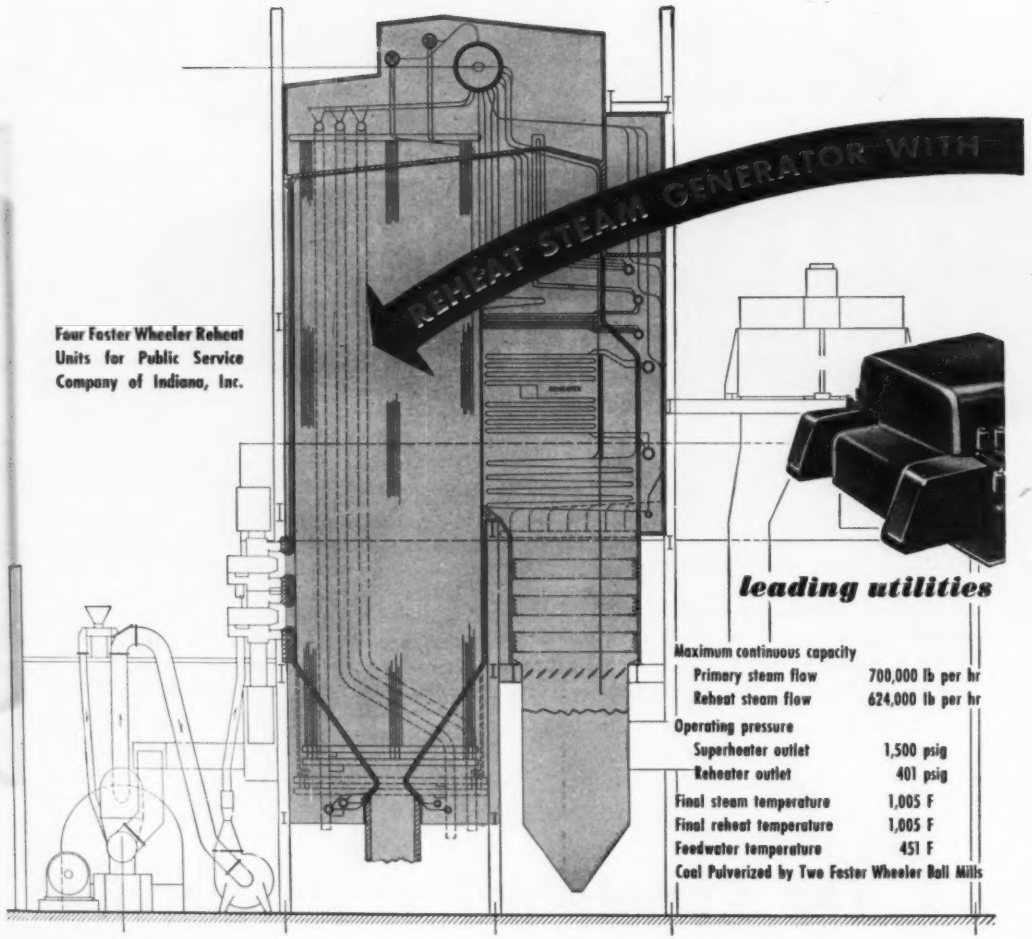
Standard

The Standard Transformer Co.

Warren, Ohio

Representatives in principal cities

Integrating

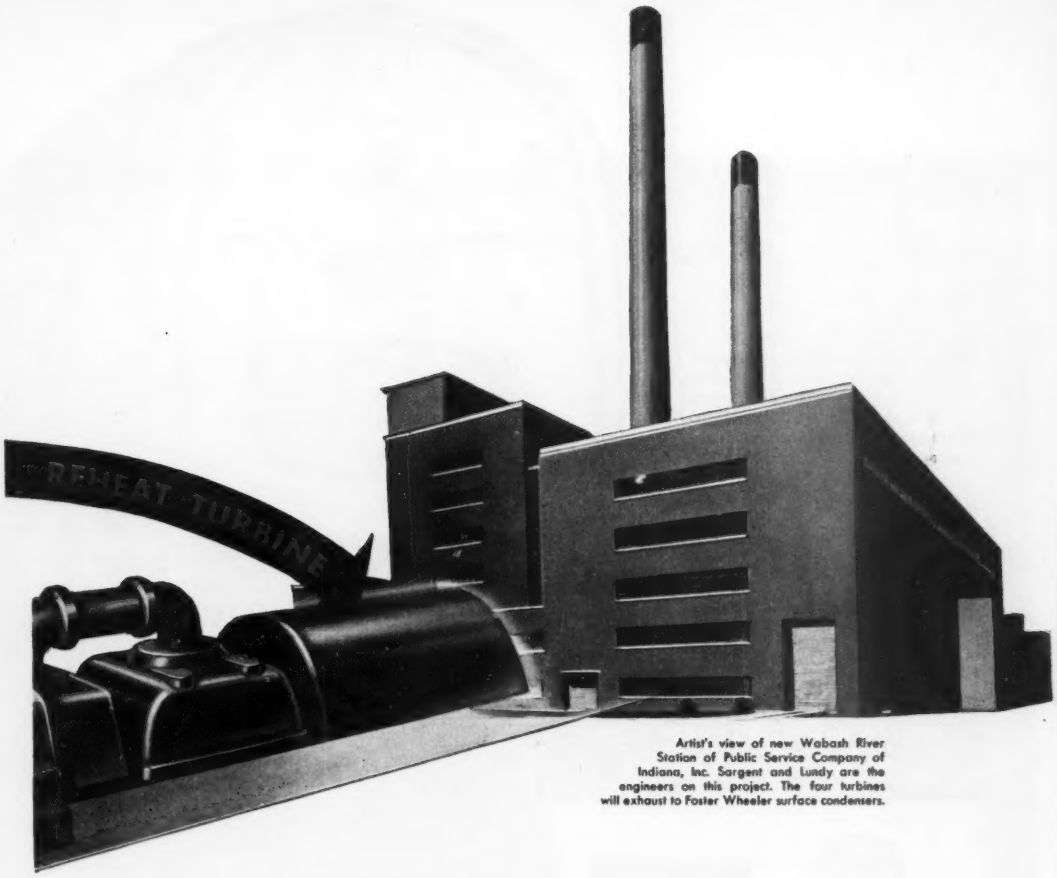


Four Foster Wheeler Reheat Units for Public Service Company of Indiana, Inc.

leading utilities

Maximum continuous capacity	
Primary steam flow	700,000 lb per hr
Reheat steam flow	624,000 lb per hr
Operating pressure	
Superheater outlet	1,500 psig
Reheater outlet	401 psig
Final steam temperature	1,005 F
Final reheat temperature	1,005 F
Feedwater temperature	451 F

Coal Pulverized by Two Foster Wheeler Ball Mills



Artist's view of new Wabash River Station of Public Service Company of Indiana, Inc. Sargent and Lundy are the engineers on this project. The four turbines will exhaust to Foster Wheeler surface condensers.

are ordering Foster Wheeler reheat steam generators

The large investment in present day power plant equipment dictates the careful selection of major components so as to avoid costly forced outages. Foster Wheeler engineers have always sought to refine the techniques of steam generation. They therefore took an early interest in the development of reheat where operating and control characteristics of the reheat boiler are integrated with those of the reheat turbine during every phase of service. Almost three decades ago, these engineers were responsible for the utilization of the characteristics of radiant and convection superheaters in series. Over "500 radiant superheater years" in one utility alone attest to the reliability of radiant surface for superheating.

The reheat steam generator illustrated is designed with a combination radiant and convection superheater and an all convection reheater. The chief advantages of this type of Foster Wheeler reheat steam generator may be listed as follows:

- complete freedom from furnace slagging is assured because furnace can be designed to suit fuel characteristics rather than reheat cycle duty requirements
- permissible wider selection of fuel of varying slagging characteristics
- location of the reheater deep in the convection zone assures safer metal temperatures during all starting, shutting down, and emergency operating conditions

This design also incorporates such features as:

- complete drainability of all superheating and reheating surfaces essential to quick and normal starts
- wide range of precise control of final steam temperature
- fully independent means of controlling primary and reheat steam temperatures.

These features provide for complete integrating of steam generating unit with turbine requirements under normal, quick start or emergency conditions.

FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

The new KCA combination watthour and thermal kva demand meter is available in five types for a variety of circuit applications. It's the first polyphase combination watthour and thermal kva demand meter on the market.

THERE'S A WESTINGHOUSE METER FOR EVERY APPLICATION!

Polyphase thermal kva demand meters.

Recording kva demand meters.

Totalizing kva recording demand meters.

Kva indicating demand meters.

NEW Combination Polyphase Thermal kva Demand Meter

Cuts KVA Metering Costs!

Here's another Westinghouse "first" that answers a metering problem by helping you to attain low-cost kva demand metering. It's the new KCA Meter which combines a simple, practical method of measuring kva demand, with low maintenance cost. And it joins a large family of cost-savers because only Westinghouse offers you . . .

A complete line of kva demand equipment . . . one that meets all of your present needs and anticipates many of your future requirements!

Illustrated here are some representative examples of the diversified equipment Westinghouse offers for this important application. This is the equipment you need for accurate kva demand measurement of any power loads.

In the complete line of Westinghouse metering equipment you'll spot many opportunities for savings. So whatever your metering needs, call on Westinghouse.

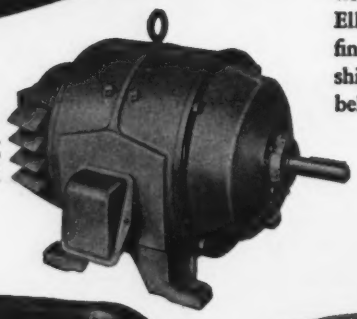
For complete information on the new KCA meter write for Catalog Section 42-340. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40395

YOU CAN BE SURE... IF IT'S Westinghouse

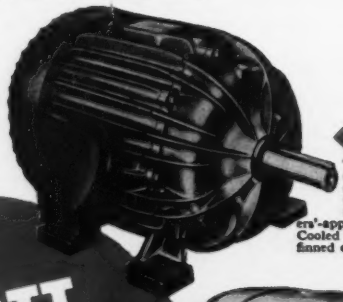
METERS

In motors from 1 hp up you're a step

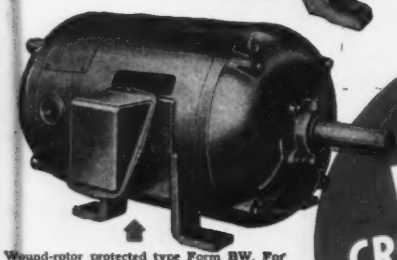
Looking for a dependable motor in any standard type, 1 hp or larger? You'll find it in this complete line, with the backing of the Crocker-Wheeler name plus the Elliott name—double assurance that you're getting as fine a motor as skilled engineering and veteran workmanship can turn out... Some representative types shown below. Write for bulletins.



DC dripproof and drip-proof-protected types Form F, in ratings to 7½ hp. Form H, 10 to 200 hp.

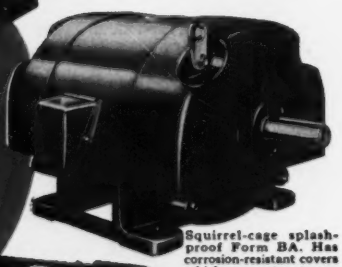


"Sealedpower" totally-enclosed fan-cooled squirrel-cage motors, 3 to 125 hp. Also explosion-proof underwriters'-approved, 20 to 125 hp. Cooled by air blown along the finned outer case.

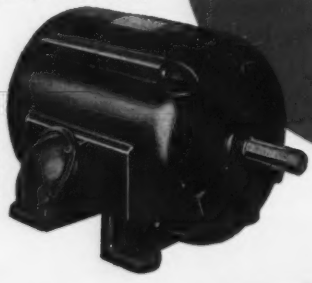


Wound-rotor protected type Form BW. For slow, smooth acceleration, high starting torque with low starting current, or variable speed. Drip-proof, splash-proof, 1 to 200 hp.

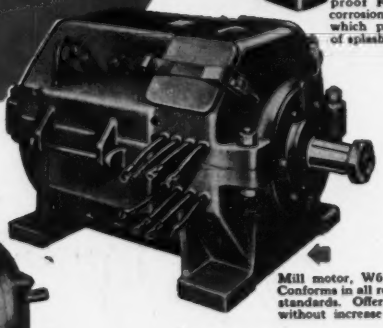
ELLIOTT
CROCKER-WHEELER
Integral
motors



Squirrel-cage splash-proof Form BA. Has corrosion-resistant covers which prevent entrance of splashing liquids.



Squirrel-cage, totally-enclosed, non-ventilated Form BE. Available up to and including 3 hp at 1800 rpm, for applications requiring protection against dust, fumes, moisture.



Mill motor, W600 Series, DC. Conforms in all respects to AISE standards. Offers more power without increase in frame size.

Squirrel-cage protected type Form BA. An open dripproof motor for general purpose use. Available in wide modifications to meet a variety of conditions.

Brake motor using latest disk type brake mounted on BA dripproof motor. Also available with totally enclosed and splashproof enclosures for AC or DC applications.

1901 1951

ELLIOTT

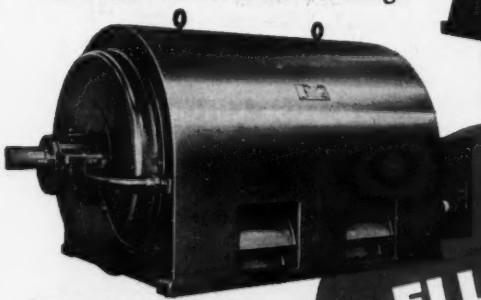
Crocker-Wheeler Division—Ampere, N. J.

ahead with ELLIOTT

Looking for a really big motor—big in quality as well as capacity? These fine Elliott motors have the exceptional strength and rigidity of welded steel construction in frame and spider with a number of other notable advantages. Fabri-steel construction marks the greatest advance in large motor design and construction since the turn of the century. Some of these outstanding motors are illustrated below. Bulletins for the asking.

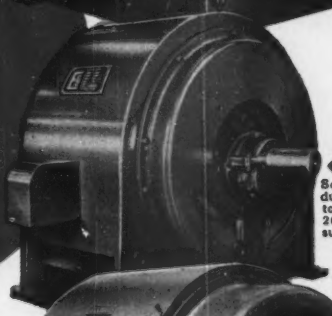
Synchronous motor for gas compressor drive. Available with solid or split rotors, open or enclosed, engine type or coupled type, rigid construction.

Totally-enclosed fan-cooled motor, cooled by heat exchanger located at top of unit. Two-pole ratings 300 to 4000 hp. For lower speeds, sizes equivalent to 50-hp, 14-pole, to 3000-hp, four-pole.

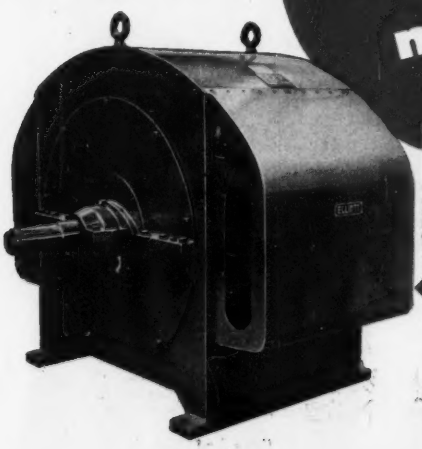


Large two-pole squirrel cage induction motor (350 hp up). A long forward step in two-pole design. Typical Elliott welded steel construction enables widest variation in type of enclosure.

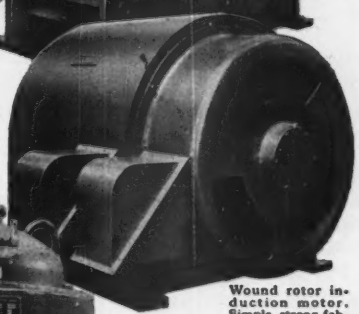
ELLIOTT large motors



Squirrel-cage induction motor, four to 14 poles, 150 to 2000 hp. All enclosure types.



Outdoor splashproof squirrel-cage induction motor especially designed for outdoor installation without protective covering. 150 hp, 14 pole to 2000 hp, four-pole. 300 hp to 1000 hp two-pole.



Wound rotor induction motor. Simple, strong fabricated construction, sleeve or anti-friction bearings. Available in all types of enclosure.

Vertical outdoor splashproof squirrel-cage induction motor. Can also be made in open dripproof or indoor splashproof with minor changes in ventilating baffles.

COMPANY

PT. 8

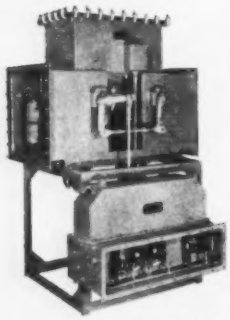
Ridgway Division—Ridgway, Pa.

DISTRICT OFFICES IN PRINCIPAL CITIES

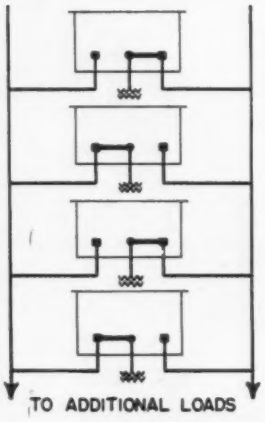
L-909

RELIABLE DISTRIBUTION WITH RADIAL FEEDERS

Loads Transferred with Automatic Load Break Oil Switches



Typical Automatic Load Break Oil Switch. 400 Ampere, 7,500 Volt. Two single-throw switches with links for air break isolation of load mounted on frame with automatic mechanism.



Reliability of service comparable to that obtained with primary network distribution is possible when two or more radial feeders supply loads through automatic load break oil switches. Automatic transfer of loads when the normal feeder fails assures a high degree of service continuity.

Considerable savings are realized in equipment cost since duplicate transformer capacity is not necessary. Further savings in operation are obtained because automatic switches require no supervision and may be installed in remote locations. They may be operated repeatedly between normal periods of inspection.

In addition to providing an inexpensive and efficient system in congested areas, automatic load break oil switches can provide the same high degree of continuity where long cable runs are necessary between load areas.

A typical system using two radial feeders to supply individual load areas through automatic load break oil switches is shown above. In normal operation half of the load areas are supplied from each of the two feeders. If a failure occurs on either feeder, the automatic switches will immediately transfer the loads supplied from that feeder to the other feeder. When the feeder is restored to service, the switches will automatically transfer to the normal source.

Possibilities for obtaining system flexibility with G & W automatic load break oil switches are practically unlimited. 400 ampere switches rated 600, 7,500, 15,000, and 23,000 volts are made with any internal link arrangement required. Operating mechanisms provide automatic transfer from normal to alternate feeder and automatic return to the normal feeder. Feeders may be balanced or sections of feeders may be isolated by remote operation of automatic mechanism to connect load to desired feeder.

Let us show you how G & W automatic load break oil switches, engineered to your requirements, *can help you obtain maximum system flexibility with minimum equipment expense.*

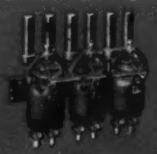
Use G & W Cable Accessories for
TERMINATING
FUSING—SWITCHING
SPLICING—CONNECTING

POTHEADS

Trouble-Free Cable Terminations
Capnut Style Disconnecting Straight Through
Write for Bulletin AB51

Type "ST-SODERTITE"—*Bulletin AA50*

OIL FUSE CUTOUTS



Single or Gang Operated Fuse-Switch Units
Write for Bulletin CA50

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Air or Oil Filled
Fuses, Links or Direct Connection

Many Sizes, Styles, Ratings

UNIT SPLICING KITS

Packaged Materials for Properly Designed Joints for all Types of Cables
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V.C. CABLE

Roebling Varnished Cambric is your A-1 specification for heat resistance

YOU'LL GET maximum dependability... you'll save real time and money... by adopting Roebling V. C. Cable as leads for transformers, generators, motors and oil switches... Roebling V. C. is furnished in single conductor sizes from 2,000,000 C.M. to #14 A.W.G.; in multiple conductor sizes from 750,000 C.M. to #14 A.W.G. It is recommended for use up to 17,000 volts between phases in single or multiple conductor construction; and to 26,000 volts for single conductor grounded neutral.

A big share of Roebling's complete line of electrical wires and cables is required today in the nation's rearmament program, but we shall do everything possible to meet your requirements. John A. Roebling's Sons Company, Trenton 2, New Jersey.

Manufactured with solid conductors or stranded in a variety of strandings, coated or uncoated, according to your needs. Available in single or multiple conductor.

Insulated with varnished cambric tape, in accordance with I.P.C.E.A. and Underwriters' specifications unless otherwise specified by you.

For outside covering you have a choice of braid, for service in dry locations; lead, for service in damp locations; and for aerial use or direct burial we recommend a protective armor such as steel tape or galvanized round wire armor.

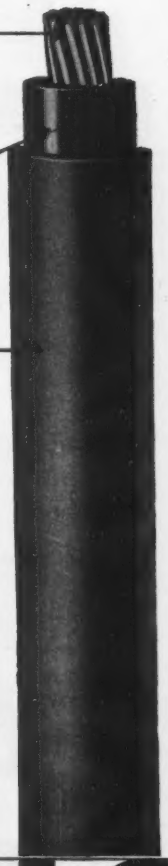
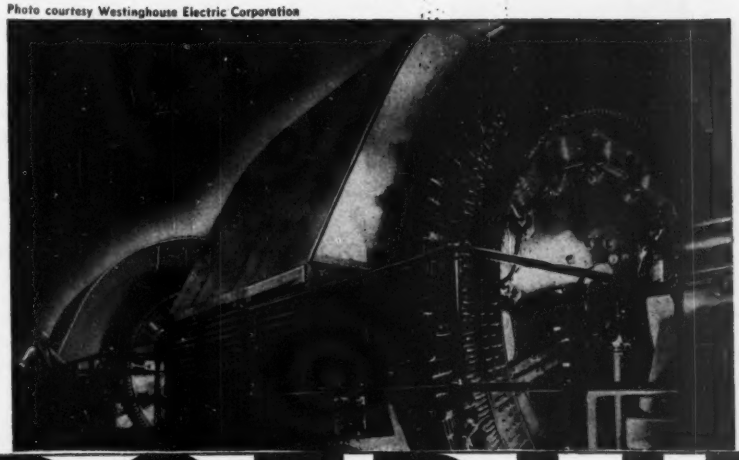


Photo courtesy Westinghouse Electric Corporation



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THOMAS Superior-Quality INSULATORS .

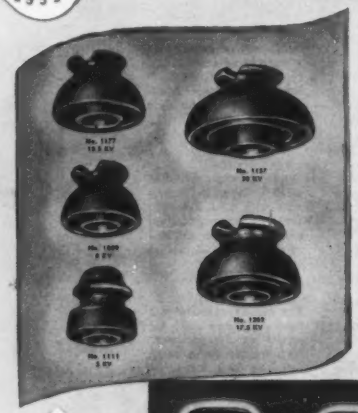


Fig. 1—Superior-Quality Pin-Type Insulators

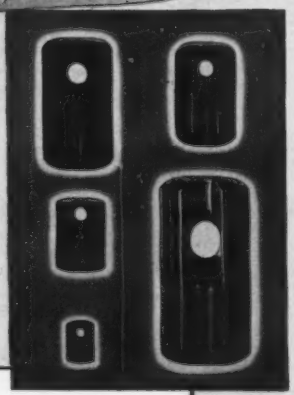


Fig. 2—Guy-Strain Insulators

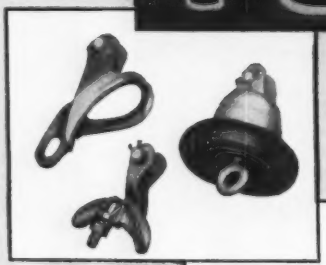


Fig. 3—Distribution Hardware

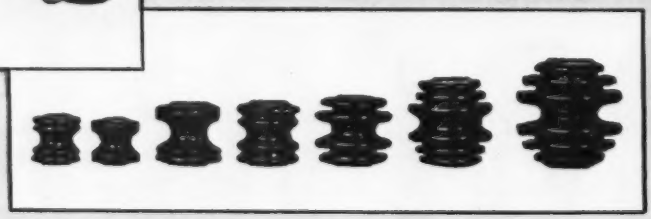


Fig. 4—Spool Insulators

the ingredients of Superior-Quality Insulators are . . .

Proper Designing
Precision Manufacturing
PROOF OF PERFORMANCE

Since the beginning of the Electrical Industry, Thomas has been supplying porcelain for the most difficult insulation problems . . . whether high-voltage transmission or low-voltage distribution. And despite these unusual times, when quality and skilled workmanship could be sacrificed, you can specify Thomas Insulators with full confidence that quality and value cannot be surpassed.

Specifically, our Distribution Porcelain and hardware are backed by 78 YEARS of ceramic experience and knowledge. Consequently, THOMAS porcelain is the standard of comparison for discriminating engineers throughout the Electrical Industry.

All THOMAS Insulators have been constantly improved. Typical THOMAS advancement is our complete line of *patented . . .

Quiet-Type Insulators

*Patent No. 2154387

ENGINEERS, MANUFACTURERS AND DESIGNERS SINCE 1873

. . . . Standards of DISTRIBUTION QUALITY

Quiet-Type Insulators

Record acceptance by the Industry proves these radio noise-free pin-types (Figures 5, 6, 7 and 8) are setting tomorrow's standards. It's not surprising . . . for they eliminate all insulator radio-interference.

Thomas engineers pioneered and were first to develop the under-glaze metallic oxide coating—applied to the areas indicated by red in Figure 7. The result is a barely discernible coating—contamination free because it's under the glaze. Sprayed on before firing (Figure 6), it becomes a permanent part of the porcelain—can't come off and guarantees positive noise-free operation without sacrificing any insulating qualities.

Line and laboratory tests prove the superiority of these insulators over conventional types. As you see on the graph (Figure 8), it takes four times as much voltage to produce noise-making microvolts with the Thomas "Quiet-Type" design.

In terms of customer goodwill your Thomas "Q-T" Insulators earn their slight additional cost many times over.

SPECIFY THOMAS INSULATORS—THE BEST BY LINE TEST

— *Since 1873* —

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, preformed armor rods and so on.

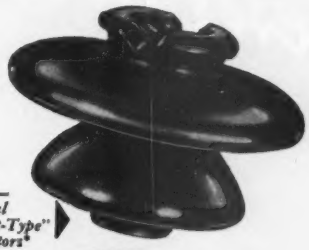
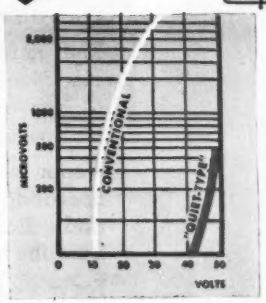


Fig. 5— Typical "Quiet-Type" Insulators

Fig. 6— Spraying under-glaze metallic oxide coating.

Fig. 7—

Fig. 8—



The R. Thomas and Sons Co.

LISBON, OHIO

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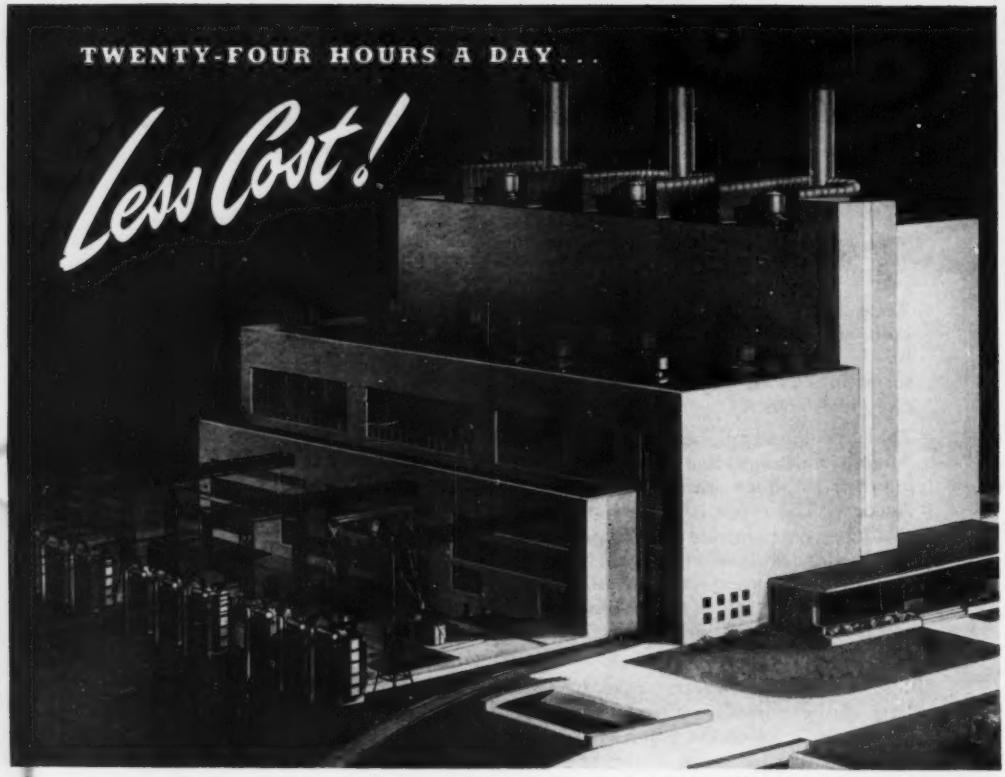
TWENTY-FOUR HOURS A DAY...

Less Cost!



Designed and Built by The Kuljian Corporation

Electric power producers are under more constant pressure than almost any other industry.

They must be prepared to carry normal loads around the clock year after year and meet large unexpected demands at any hour. They must be sensitive to every industrial and commercial need.

Under such trying conditions, it is basic that efficient operating practice alone is not enough. Utmost economy and reliability must be *built into* each generating unit from the start.

For more than a score of years, Kuljian engineering and Kuljian construction methods have been building long life and money saving efficiency into power plants for both public utilities and large industrial plants.

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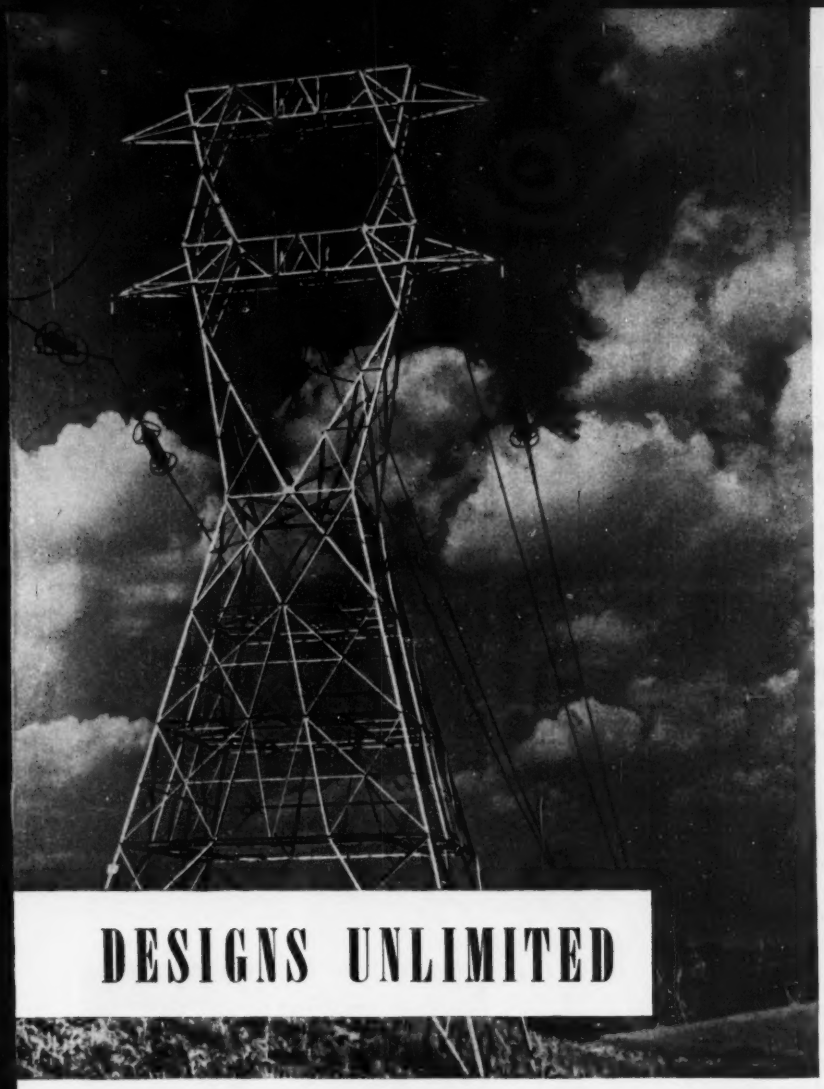
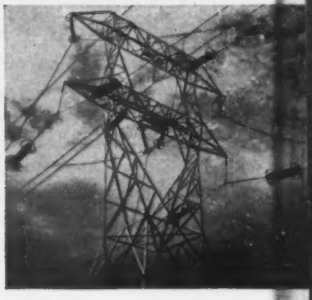
The **Kuljian** *Corporation*

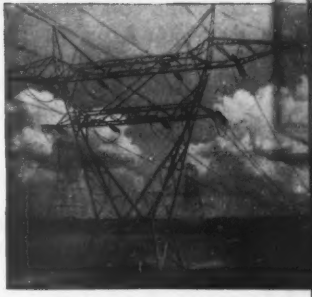
ENGINEERS • CONSTRUCTORS

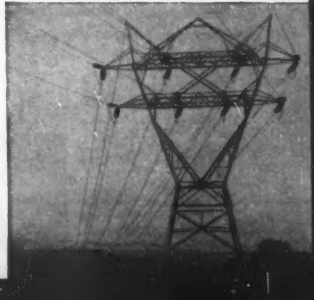
1200 NORTH BROAD STREET, PHILADELPHIA 21, PA.



DESIGNS UNLIMITED







If your engineers have their own ideas on tower design, well and good. We will follow them to the letter and adhere closely to specifications. Your engineers realize, as we do, that despite general similarity no two towers are alike. Each tower must be designed for its particular location and purpose.

Let us apply our four decades of experience in building towers for any and all conditions of terrain and load, to your power transmission problems.

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY
2013 Farmers Bank Building, Pittsburgh 22, Pa.

BLAW-KNOX
TRANSMISSION TOWERS

No. 4- hook-operated . . .

★ *The Type H-U Hi-Voltage Hook-Operated Disconnecting Switch is a single-throw switch for vertical mounting in outdoor service.* It is available in capacities from 400 to 2,000 amperes, 7,500 to 115,000 volts.*

The Type H-U embodies design characteristics that guarantee *certain operation* anytime . . . under any condition . . . even after years of standing idle. Four features are outstanding:

1—Independently hinged blades
2—Stainless steel contact springs
3—Silver-nickel contacts
4—Pry-off lock action

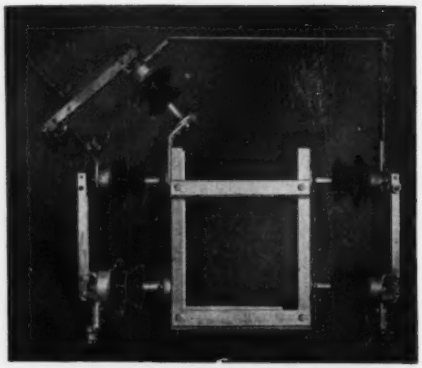
Look over these advantages on the opposite page. They are in keeping with the traditional high quality and positive performance assured by all Hi-Voltage Switches . . . they are reasons for the continued superiority of Hi-Voltage in the air-switch field.

And any Hi-Voltage design reduces switch installation cost from 20 to 40%, because the mechanism is completely pre-machined and pre-fitted at the Factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated.

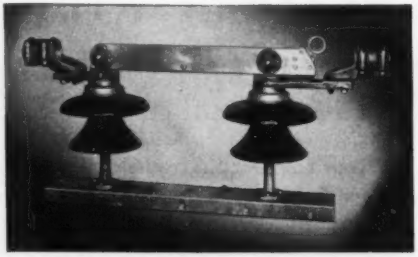
Specify Hi-Voltage and gain the advantages of lower installation costs and certain operation.

Future advertisements in this series will discuss the merits of other types of Hi-Voltage Switches. In the meantime, let your Joslyn Representative give you the whole story.

**Also available for underhung mounting and in double-throw and transfer designs for either vertical or underhung mounting.*



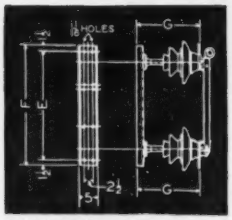
Many special arrangements can be made with Hi-Voltage Hook Switches. Above is shown a compact, economical unit that can be mounted on a beam or girder. Two standard Type H-U's are combined with a by-pass switch that is operated by a lever hinged on the blade.



A 2000-ampere switch is shown here. Note its heavy-duty construction. Contact pressure is maintained and evenly distributed by six stainless steel compression springs at each end of the blade . . . still the best means of assuring *correct* contact pressures with no undue wear of the silver contacts.

HI-VOLTAGE

type H-U disconnecting switch



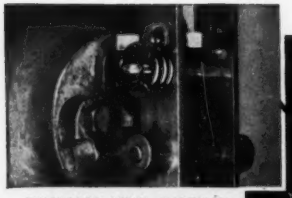
TYPE H-U HOOK-OPERATED SWITCH FOR VERTICAL MOUNTING

TYPE H-U HOOK-OPERATED SWITCHES

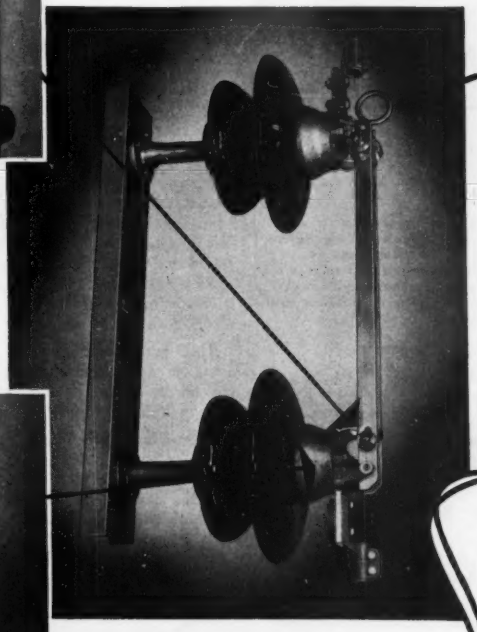
VOLTAGE	DIMENSIONS IN INCHES		
	E	F	G
7,500	18	21	9⅝
15,000	21	24	12⅛
23,000	24	27	14⅛
34,500	30	33	17⅛
46,000	38	41	20¼
69,000	50	53	31¼
115,000	As required		51¾

Hi-Voltage SWITCHES ARE AVAILABLE

from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.



STAINLESS STEEL CONTACT SPRINGS—On all switch models, contact pressure is maintained by stainless steel compression springs of ageless flexibility. Moisture cannot rust them nor interfere with the maximum conductivity they develop.



PRY-OFF LOCK ACTION assures easy opening under ice conditions and when switch location necessitates a pull with the switch stick almost parallel to the blade.

SILVER-NICKEL CONTACTS welded to copper on 600 to 2,000-ampere switches . . . your guarantee of permanent conductivity and non-gauling, corrosion-proof performance.

INDEPENDENTLY HINGED BLADES operate entirely independent of the hinge-end contact. Thus, misalignment which sometimes results from installation can never affect their smooth operation and positive conductivity.

ALSO AVAILABLE!

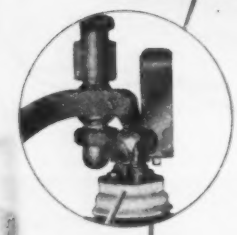
- Grounding Switches
- Manual and Automatic Control Mechanisms
- Mechanical Interlocks
- Hi-Voltage Fuses
- Cross-arms and Mounting Frames
- And all customary accessories

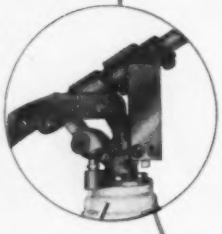
EQUIPMENT COMPANY

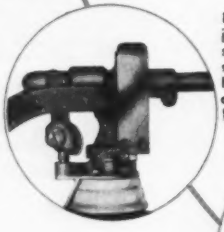
4000 EAST 116th STREET • CLEVELAND 5, OHIO

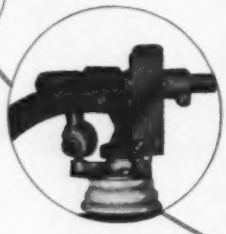
You can't beat a WAG for

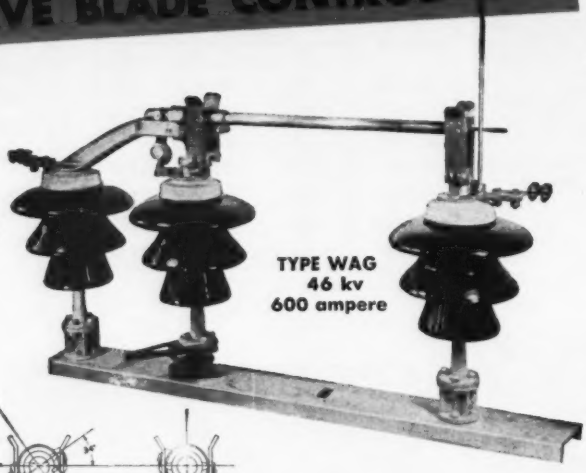
•HIGHER BLADE TORQUE
•MINIMUM OPERATING EFFORT
•POSITIVE BLADE CONTROL











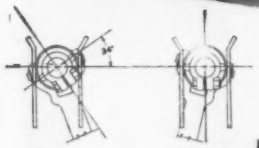


FIG. 1 FIG. 2

Rotation of blade after entering jaw is illustrated above. Figure 1 shows the switch blade against the stop before contact engagement. Figure 2 shows position of the contacts after full rotation of the blade.

The Type WAG is easy to operate! Yet contact pressures are higher, contact deflection wider and blade rotation after contact engagement is greater than usually employed in this type of equipment. These vital features have been successfully combined by utilizing extremely high blade torque. A simple system of cranks and levers provides the superior mechanical advantage to reduce operating effort to a minimum.

The blade is under positive control throughout its cycle of operation and toggles under the axis of the blade in the closing operation . . . positively locking it in that position.

Follow the closing* sequence of the Type WAG in the series of photographs at the left. In one continuous motion of the crank arm, the blade swings into the closed position and then rotates to establish high pressure contact.

*The opening operation is the inverse.

AVAILABLE
7.5 kv to 161 kv
400, 600, 1200,
2000, 3000, 4000 amperes

WRITE FOR BULLETIN 190-R

Southern States Equipment Corp.
HAMPTON GEORGIA

"It has won my confidence over the years

That's why I Specify

ORANGEBURG"

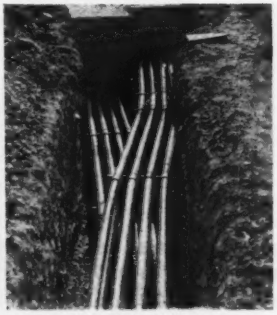
— says the Utility Engineer

Here are some of the reasons why this Utility Engineer, and many others like him, entrust their vital cables to Orangeburg for permanent protection.

• Will not corrode. Lasts indefinitely. • Impermeable wall and tight joints prevent corrosive ground waters from entering. • Lays faster and at lower cost than any other type of conduit. • Low coefficient of friction keeps pulling tensions on cable to minimum. • Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. • Resists acids, alkalis, grease, oil. • Light, easy to handle and tool on the job. • Tough, resilient—will not crack or break when properly handled.

ORANGEBURG NOCRETE

Installed *without* concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.



ORANGEBURG STANDARD

Installed with concrete encasement. The *preferred* conduit for banks of three or more ducts.

OUR NATION MUST HAVE UNINTERRUPTED POWER

One of today's great national assets is the continuous flow of power to industry, business and home. Every utility engineer knows that the unfailing supply of power depends on well protected cables. Cables always get that protection from Orangeburg Conduit. For 58 years, Orangeburg has successfully served the Electrical Industry because of its proved ability to provide a time-defying raceway for the permanent protection of electrical services underground.

And now as the Nation looks to the public utilities and municipalities to maintain and even increase their high standards of service, more and more of them are turning to Orangeburg Conduit. They are doing this because experience has made them sure that cables installed underground in Orangeburg *stay safe* and *keep the power flowing.*

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

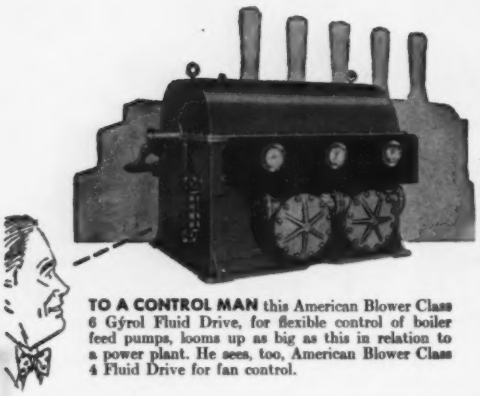
NOCRETE Installed without Concrete

GENERAL ELECTRIC SUPPLY CORPORATION

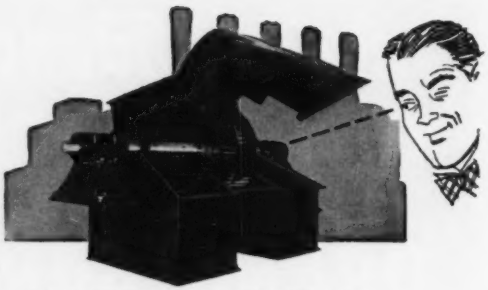
DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

GraybaR ELECTRIC COMPANY

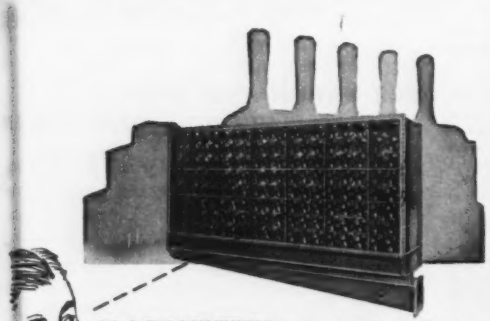
It all depends on how you look at it



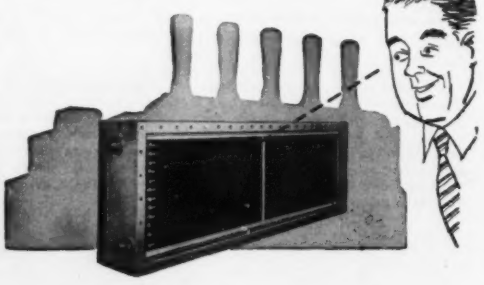
TO A CONTROL MAN this American Blower Class 6 Gyrol Fluid Drive, for flexible control of boiler feed pumps, looms up as big as this in relation to a power plant. He sees, too, American Blower Class 4 Fluid Drive for fan control.



TO A MECHANICAL DRAFT MAN a Sirocco Multi-Blade Fan, which delivers more gas per revolution than any other type, takes *this* proportion in the picture. He could see an American Blower HS Fan equally large if thinking of forced draft.



TO A FLY ASH EXPERT an American Blower Type ST Fly Ash Precipitator looks like this in relation to the rest of the power plant. Little wonder, for the Precipitator lifts a load off his shoulders and minimizes a nuisance.



TO A COIL MAN American Blower Heavy Duty Steam Coils would appear like this in his power plant picture. He likes their great strength, easy accessibility and the way they withstand the high pressures of heavy loads.

Looking at your complete power plant picture, we believe you'll find, as hundreds of others have, that all these American Blower Products improve over-all power-plant efficiency and insure years of dependable operation. Call our nearest Branch Office for complete data.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

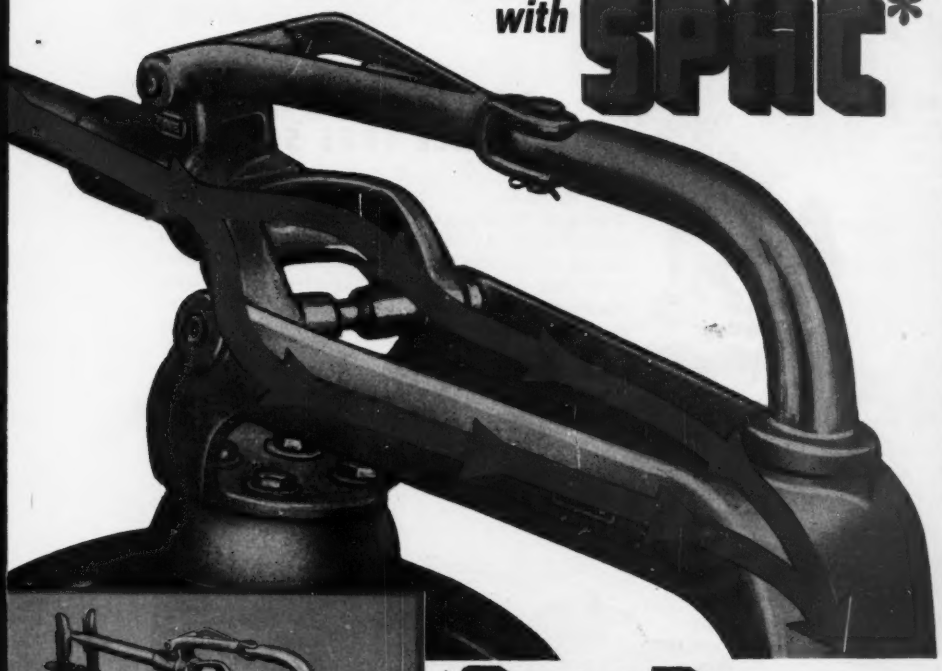
Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

A SUPER-HIGHWAY FOR CURRENT

NO EXPOSED CONTACTS at hinge..

with SPHC*



Above is the complete 34.5 Kv., 600 Ampere switch. At top—enlarged portion of hinge and blade mechanism.

*Sealed Pressure Hinge Contact

This new Sealed Pressure Hinge Contact development is truly an ingenious feature at this very critical point. Current flow is unhindered by exposed joints or break contacts.

Completely enclosed and weather-sealed, Hi-Pressure, Hi-Thermal capacity, silver to copper contact is a super-highway for current. Continuous, annular, constant electrical and mechanical contact at all times —entirely eliminates any second break contact. Current carried through BOTH hinges.

Only one "break" contact is necessary on a switch. Why have more than one—which creates another critical point?

✓ CHECK these extra FACTS

1. **JAW CONTACT**—Hi-Pressure, Hi-Thermal capacity silver-to-copper. The ONLY "break" contact on the switch.
2. **BLADE MECHANISM**—Simple, harmonic, self-locking, accurately controlled blade motion.
3. **BLADE**—One-piece, hard drawn copper.
4. **TERMINALS**—Four-bolt, equal height from base.
5. **BEARING**—Greaseless, weather-sealed, stainless ball bearing.

I-T-E R&IE

RAILWAY and INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA: EASTERN POWER DEVICES LIMITED, TORONTO

AN I-T-E SUBSIDIARY

The Check List

- CONDUCTOR SUPPORTS CLAMPS AND FITTINGS
- ✓ DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

UTILITY WORKHORSE-

LINE CONSTRUCTION BODY (500)
Medium and heavy duty work. Vertical compartments are optional . . . can be equipped to fit individual needs.

REVOLVING AERIAL LADDER
Models available in working heights of 23' 6", 26' 6", 30' 6", and 32' 6" for all styles of bodies.

LIGHT DUTY MAINTENANCE BODY (350)
Fold-over type derrick will handle poles up to 40' in length. 24' ladder extends from rear of body.

HYDRAULIC TOWER
Available in sizes from 21' to 30'. Platform revolves full 360°. Tower can be operated from cab or platform.

FOR LONG LIFE AND TROUBLE FREE SERVICE

All *Powers-American* bodies have *earned* the reputation of "workhorse" of the utility industry by years of faithful performance. No matter how tough the job or the operating conditions, they pull more than their share of the load by stepping up crew efficiency and lowering operating costs. Whatever your utility body needs, *Powers-American* is your *1* source for *all types* of utility bodies and equipment. Write today for more information. Put a *Powers-American* "workhorse" on your job and watch the team pull ahead!

"The Accepted Standard with Utilities Everywhere"

LINE CONSTRUCTION BODY (600)
Completely equipped to carry all tools and materials needed for line work. Can be furnished with winch and derrick, compressor, digger, or any special equipment required . . . for use in any phase of the utility industry. Available in 9' to 14' lengths, with or without built-in crew compartment.

POWERS *American* DIVISION
ACF

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE-POWERS AUTO BODY COMPANY

Ready at the Flip of a Switch!

LOW-COST POWER FOR RURAL AMERICA

CARRIED BY

Copperweld-copper TRADE MARK

CONDUCTORS

Today, on millions of farms, low-cost power is helping the farmer to greatly increase his productive capacity—basic to our nation's strength and welfare. In addition, electricity is making life in the farm home as comfortable and pleasant as anywhere in the city. We salute the vision and courage of the men and organizations who have brought about this transformation in the life of Rural America. And we are proud of the important part Copperweld*-copper Conductors are playing in rural electrification.

Hundreds of thousands of miles of these rugged Copperweld-copper Conductors have proved their ability to stand up under all types of operating conditions and deliver dependable and economical service year after year. They are the only conductors that combine tremendous strength for long spans—vibration-reducing triangular design—and completely non-rusting construction. Always specify Copperweld-copper for your rural lines. You'll find it pays in longer life, less maintenance, and lowest annual cost.

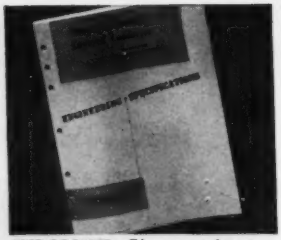
*Trade Mark

COPPERWELD STEEL COMPANY, Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES

Copperweld-copper TRADE MARK **DEPENDABLE CONDUCTORS**

— Cost Less BECAUSE THEY Last Longer



FREE BOOKLET—Gives complete engineering data on the new Kaiser Aluminum Conductor. Includes both weatherproof and self-supporting conductor. Send for it today!

MORE ADVANTAGES—Neoprene covering on Kaiser Aluminum Weatherproof Conductor is abrasion resistant, fungi resistant . . . and there's no festooning as with conventional textile coverings.

HIGHEST QUALITY—Our production personnel have had long experience in the conductor field, employ the finest production facilities. Conductor is tested by the most modern instruments.

This line means lower costs, longer life!

WHEN you install Kaiser Aluminum Weatherproof Conductor for distribution lines or service drops you cut costs by 30 to 40 per cent.

Here's why: 1) First cost is lower than with copper. 2) Reduced weight—approximately half that of copper—permits longer spans, speeds installation. 3) Diameters are smaller than the usual triple braid weatherproof, reducing ice and wind loads, relieving tension on house and pole.

Good splices and taps are assured because Kaiser Aluminum Weatherproof Conductor is clean stripping. The neoprene covering is smooth, homogeneous, seamless, thus resists moisture.

Apply these advantages to *your* installations. Call us today for all the facts.

Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Also distributed by: General Electric Supply Corporation, Line Material Company, Mine & Smelter Company, Tafel Electric and Supply Company, Westinghouse Electric Supply Company.

TECHNICAL ASSISTANCE—Our large staff of experienced service engineers will gladly provide technical assistance and help with construction problems. Call any Kaiser Aluminum office. See your Classified Telephone Directory.

Kaiser Aluminum

Setting the pace . . . through quality and service

Mr. Resale Machinery Manufacturer . . .

Here is a full line of motor starters Manual or Automatic—Single or Polyphase

If you use different types and sizes of motor starters on your machines . . . it will pay to standardize on the A-B line.

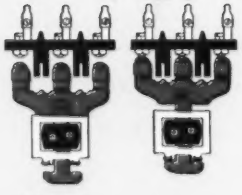
Why? Because this line is uniform in design up to 300 hp. All Allen-Bradley starters are solenoid or straight line operated . . . with maintenance free, silver alloy contacts . . . and dependable overload relays.

Allen-Bradley manual and automatic starters are nationally advertised. They are recognized the world around as *Quality Motor Controls* by important machinery buyers and plant engineers.

The Allen-Bradley Handy Catalog is an up-to-the-minute guide for efficient motor controls and accessories. Let us send you a copy of the latest edition. Write, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

751-M



SIMPLE—

Only One Moving Part

The key to the remarkable performance of Allen-Bradley solenoid starters is their simplicity. They have no pins, pivots, or bearings to stick . . . no jumpers to break.

There is just the one-piece solenoid plunger in a frictionless slide. Such simplicity means long, trouble free operation in the toughest service.

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

Sell Your Machines "Factory Equipped" with these TROUBLE FREE STARTERS...

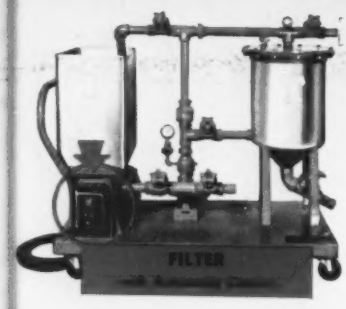
They enjoy world-wide acceptance

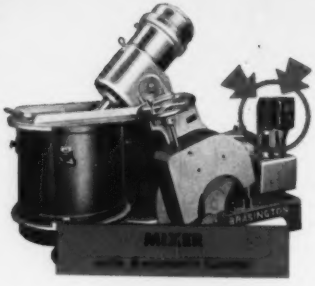
Your motorized machines are no more dependable than their motor controls. So why not add a big sales asset to your products by featuring A-B trouble free controls as standard equipment.

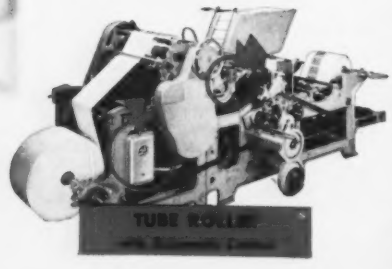
The A-B name plate means Quality controls to your customers.

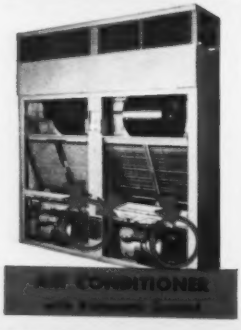
They have learned and know the operating advantages of Allen-Bradley solenoid controls—no pivots, pins, hinges, or bearings to corrode and stick—no contact maintenance.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.









751-M

Enclosures for Every Service

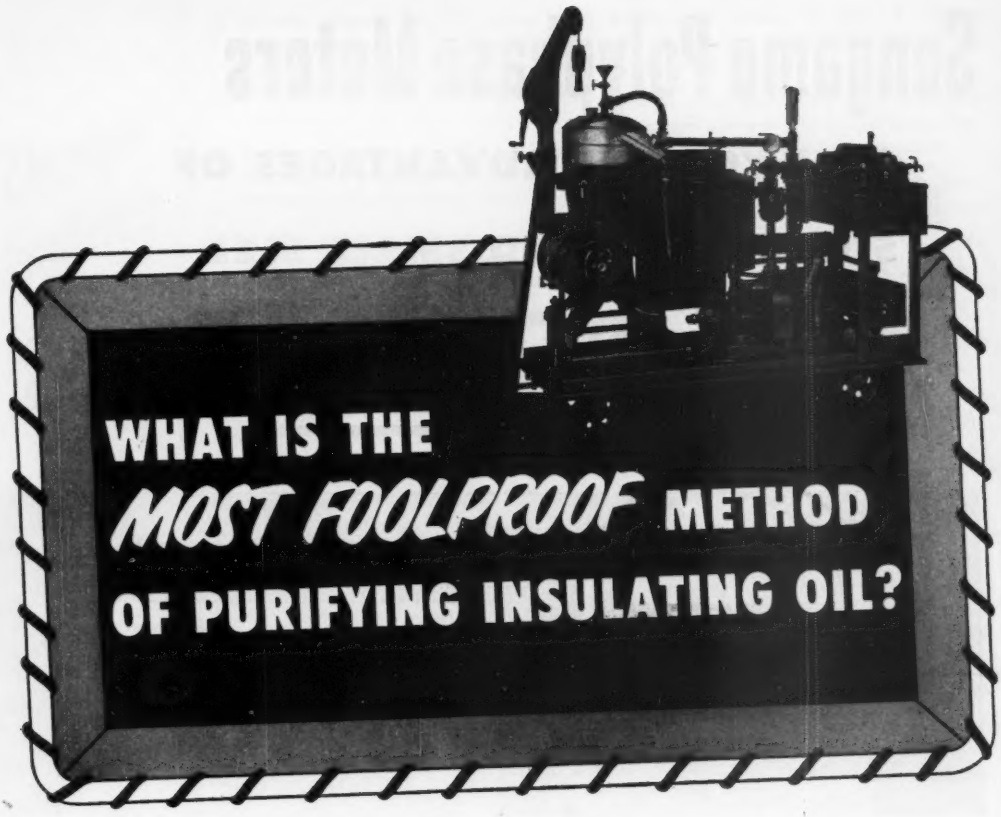
A-B Quality

Send for the Allen-Bradley Handy Catalog

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY



The De Laval centrifugal method is the safest, most foolproof way to purify insulating oil. The centrifuge dehydrates and cleans transformer or switch oil in a single pass; no rerunning is necessary.

The De Laval method is safest because water once removed from the oil flows to waste, hence cannot recontaminate the oil. Action is both instantaneous and positive. With the De Laval Oil Purifier there is never a chance that a batch of oil in process of being purified will go from a high to a low dielectric test in an instant.

The De Laval Insulating Oil Purifier is available as a Portable Outfit for extra convenience.

DE LAVAL

INSULATING OIL PURIFIERS

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

Sangamo Polyphase Meters

GIVE YOU THE ADVANTAGES OF

SINGLE DISK AND SMALL SIZE–

even in 3 Element Types

Type LC-3-P
3 element, self-contained. For 4 wire, 3 phase Y circuits.

Type LC-3-S
3 element, self-contained. For 4 wire, 3 phase Y circuits.

✳ Only a minimum of space is necessary for mounting either 2-element or 3-element Sangamo polyphase watthour meters for power metering on all commercial and industrial applications.

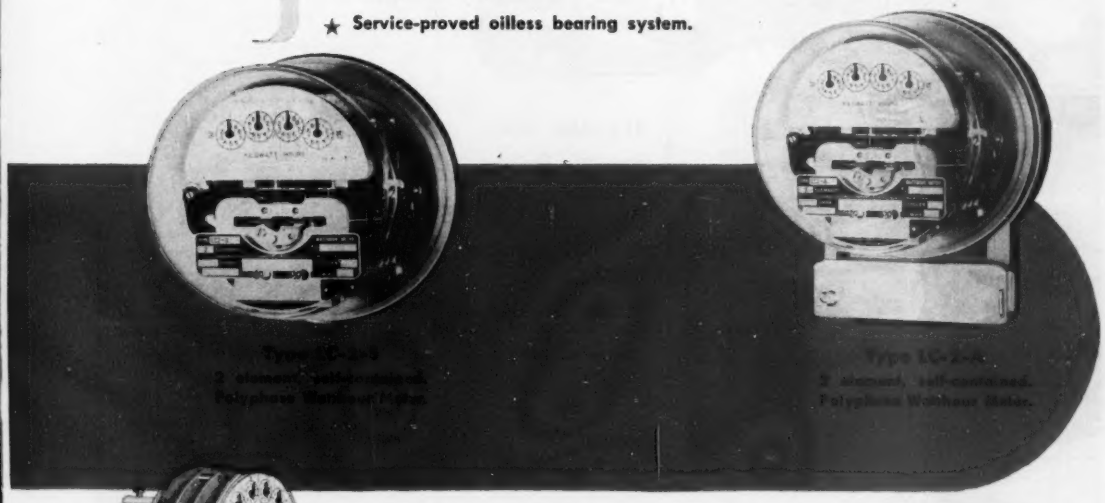
The complete Sangamo Type LC polyphase line, whether 2, 2½ or 3 element meters, have *single disk* construction which permits their manufacture in the *smaller* sizes required of modern meters for standard "A" "S" or "P" mountings.

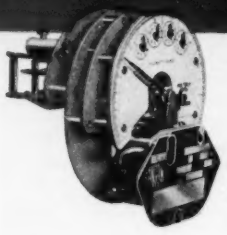
Mechanical stability—electrical characteristics—full temperature and overload compensations—resulting from the modern design features of Type LC meters, assure dependable service and high accuracy of measurement over the entire load range up to 400% of meter rating.

SANGAMO

Design features

- ★ **Driving element, moving system and register all mounted on one die-cast supporting grid, assuring permanent mechanical relation of all component parts.**
- ★ **Damping magnets of alnico are highly resistant to the demagnetizing effect of lightning surges and stray fields.**
- ★ **A basic constant of 0.6 watthours per disk revolution for each element, producing excellent inherent overload and voltage characteristics.**
- ★ **Service-proved oilless bearing system.**
- ★ **Generous design of copper in current coils provides high thermal capacity on overloads.**
- ★ **High insulation levels of potential and current elements. Also terminal insulation highly resistant to arc tracking.**
- ★ **Micrometer adjustments for full load, light load, power factor and element balance.**
- ★ **Easy accessibility of all parts for inspection and adjustment or replacement.**





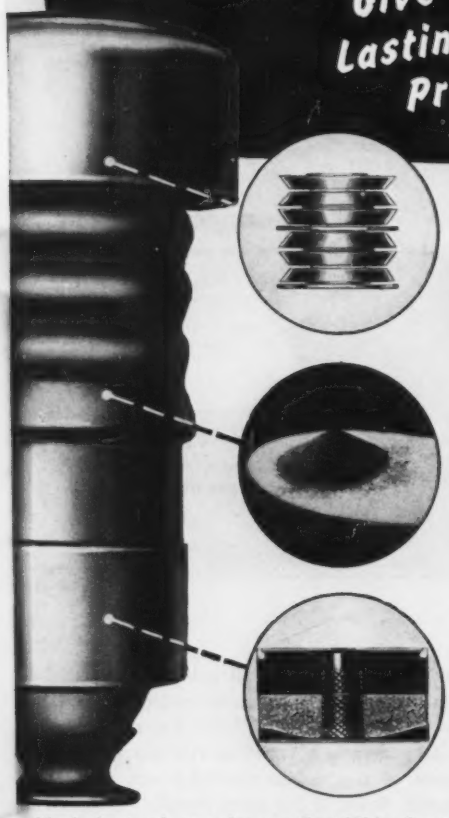
For convenient, dependable demand measurement on all polyphase circuits use Sangamo Type LCH demand registers on Type LC meters. These registers are timed by the new Sangamo low speed, high torque, hysteresis type motor, lubricated with a silicone of constant viscosity over wide temperature ranges. Years of troublefree operation are assured without expensive maintenance. Bulletin 321 gives complete information.

Write for Bulletin 240 for detailed information on LC Meters.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

CRYSTAL VALVE ARRESTERS Give Lasting Protection



REASONS WHY:

High Speed Multiple Arcing Unit
Crystal Valves embody time-proved spark gap units of multi-gap construction.

Oxidized Silicon Carbide Grain
Highly developed valve element is an exclusive feature of Crystal Valves.

Duplex Base Seal
Design feature prevents moisture from entering arrester despite severest weather conditions.

Month after month, year after year, Crystal Valve Arresters give you long lasting protection, plus all of the desired performance characteristics. Oxidized Silicon Carbide grain ideally suited for application as a valve element is found only in Crystal Valve Arresters. The true valve action is constant, unaffected despite extreme weather conditions. Split-second protection for your transformers, or other electrical equipment, is assured, preventing lightning "black-outs" from retarding service.

For efficient, reliable service, specify and use Crystal Valves on your power line equipment.

Write Dept. 1709 for latest technical data on lightning arresters and their installation. Ask for CV catalog. No obligation.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

FUNDAMENTALS OF LIGHTNING PROTECTION

by

J. R. McFarlin, Vice President

ELECTRIC SERVICE MANUFACTURING CO.

Let's refresh our minds on the above subject.

Failure of transformers or other electrical equipment from lightning is always the result of failure of insulation —for instance, the flashing over of a bushing or the puncture of winding insulation; such failures are always the result of a *difference of voltage* existing across or between the flashed or punctured parts.

Since this is a recognized fact, there are two ways in which failure may be prevented:

a—By *limiting* the voltage that can be built up across insulation to values which the insulation can safely withstand.

b—By *balancing or equalizing* the voltage that is built up across insulation; by doing this, though the voltage to ground or to some other part may still be high, so long as it is balanced or equalized across the particular insulation, no failure of that insulation will occur.

The foregoing can be secured through the *proper choice* and *proper application* of lightning arresters.

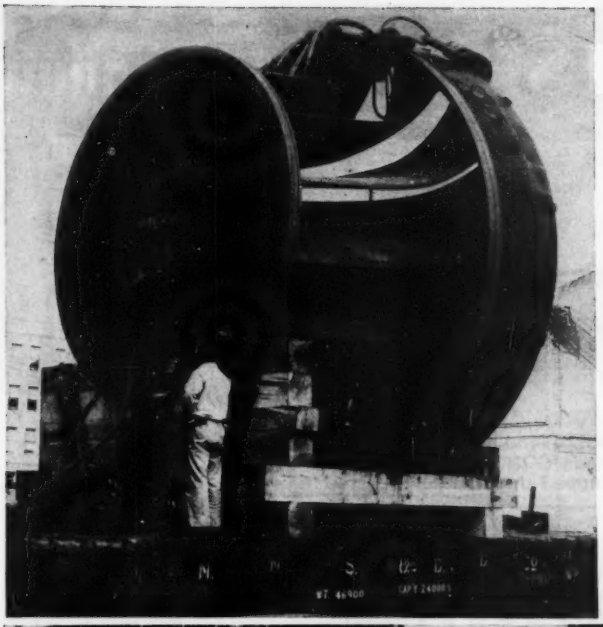
Be sure to use arresters of the proper voltage rating for the circuit on which they are to be used; published ratings are given arresters in terms of "maximum permissible line-to-ground voltage" and since they are voltage actuated devices they should under no condition be subjected to voltages in excess of their maximum rms rating.

Two extremely important factors necessary for highly efficient lightning protection are their installation on equipment and their grounding. They should be located as close as possible to the equipment which they are used to protect; this means short leads from arrester to equipment and short leads to ground; remember that a lightning arrester is a voltage limiting device in shunt with insulation to be protected and that the length of this total shunt circuit (arrester line lead, arrester itself and arrester ground lead) should be kept to a minimum.

Where earth grounds form an element of the protective installation, it is desirable to provide as good grounds as are physically and economically possible. Lightning arresters may not always be grounded to earth direct; in many cases they are grounded to grounded transformer tanks, to a grounded secondary neutral, or to a multi-grounded common neutral; however, in all such cases an earth ground becomes a part of the installation and the remarks previously given on earth grounds still apply.

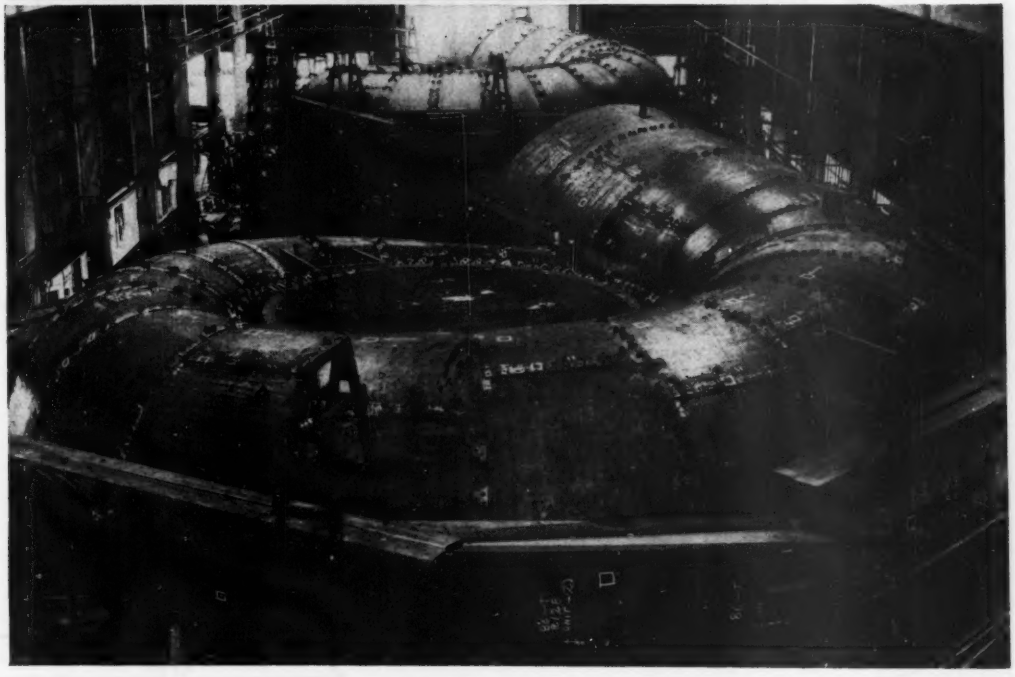
Yes, this is repetition of old information, but its proper application is still the means for securing the maximum protection that a good arrester can give.

advertisement



OVER EIGHT MILLION HORSEPOWER

The Newport News Shipbuilding and Dry Dock Company has received orders for the building of hydraulic turbines aggregating output of 8,150,000 horsepower.

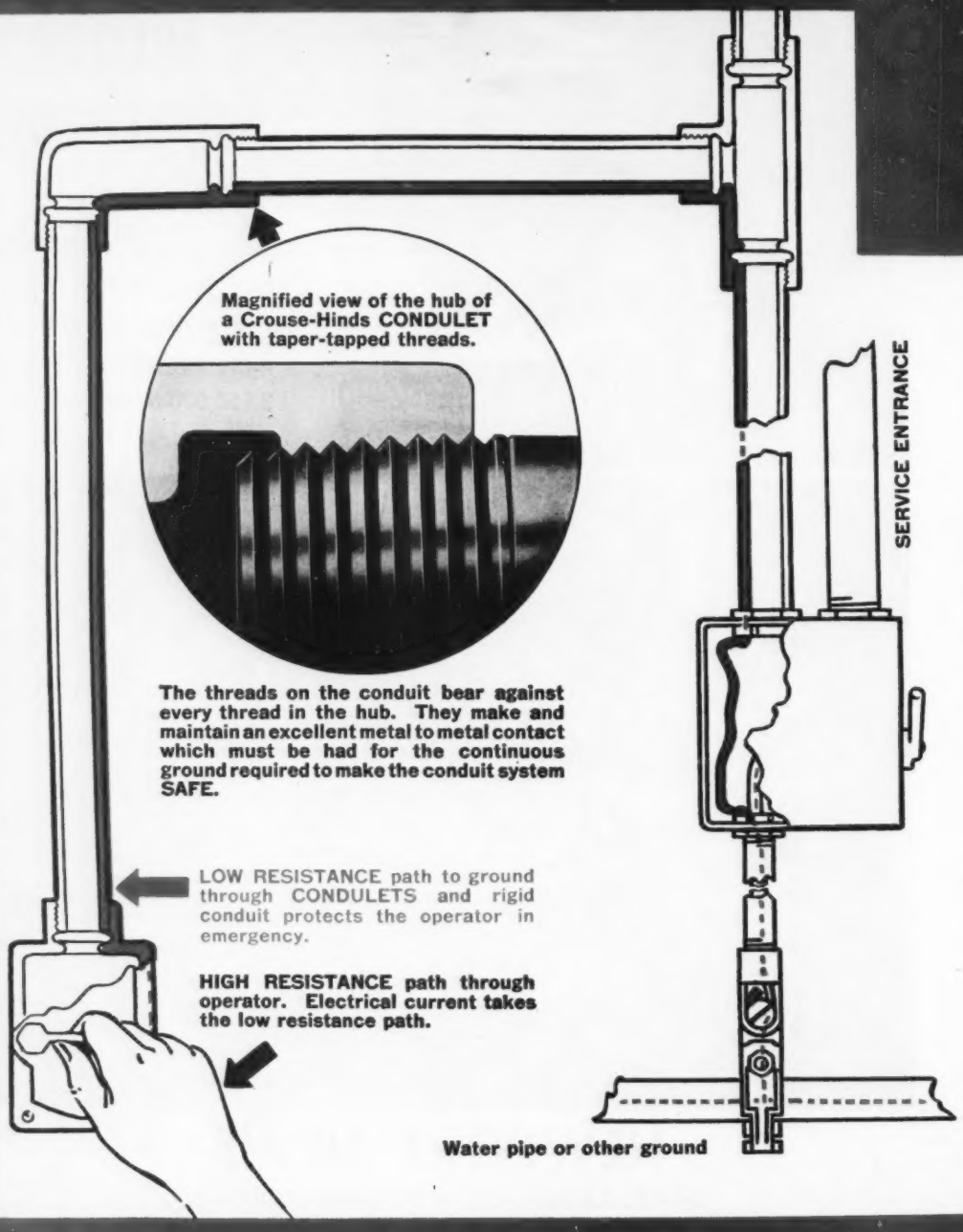


NEWPORT NEWS

SHIPBUILDING AND DRY DOCK COMPANY

Newport News, Virginia

CONDULETS* and rigid conduit


Magnified view of the hub of a Crouse-Hinds CONDULET with taper-tapped threads.
The threads on the conduit bear against every thread in the hub. They make and maintain an excellent metal to metal contact which must be had for the continuous ground required to make the conduit system SAFE.
LOW RESISTANCE path to ground through CONDULETS and rigid conduit protects the operator in emergency.
HIGH RESISTANCE path through operator. Electrical current takes the low resistance path.
SERVICE ENTRANCE
Water pipe or other ground

... the wiring method that gives you maximum SAFETY for workers AND property

Typical CONDULETS

Type T Obround Condulet

Type LR Obround Condulet

Type FS Condulet

Type WMK Enclosed Safety Switch Condulet

Type VC Vaportight Industrial Lighting Fixture

Type EVA Explosion-Proof Industrial Lighting Fixture

Type GUAC Explosion-Proof Junction Condulet

Type EPC Explosion-Proof Line Starter

Type GCH Groundulet Safety Circuit Equipment

A low resistance grounding circuit is of vital importance in any electrical system. The combination of rigid conduit and CONDULETS provides the safest installation because this combination assures the permanence of the grounding circuit. In any grounding path, every joint that isn't tight in the beginning or loosens from vibration makes a high resistance point. Such high resistance creates a hazard for workers and can cause disastrous fires.

All rigid conduit has tapered threads and all CONDULETS (made only by Crouse-Hinds) have taper threaded hubs. This combination makes a secure joint that is tight in the beginning and stays tight. These joints will not loosen from vibration and assure a reliable and permanent low resistance path to ground. This SAFETY feature provides maximum protection against personal injury and fire.

Besides safety, a CONDULET installation gives you these additional definite advantages:

- **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.
- **FLEXIBILITY.** To meet all the diverse requirements of modern electrical layouts, CONDULETS are made in a wide variety of shapes and sizes with varied hub arrangements, including a full line of CONDULETS with detachable hub plates.
- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

* *CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.*

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee Minneapolis—New York—Philadelphia—Pittsburgh—Portland, Ore.—San Francisco Seattle—St. Louis—Washington. RESIDENT REPRESENTATIVES: Albany Atlanta—Baltimore—Charlotte—New Orleans—Richmond, Va. Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

A Nationwide Distribution Through Electrical Wholesalers

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

SPEED and EFFICIENCY you never thought possible in ledger posting for utilities

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HANDLES ALL THESE JOBS—and more

Operating Ledgers • Work Order Ledgers • General Ledger • Material and Supplies Ledger • Bank Ledger • Revenue Ledgers • Accounts Receivable Control Ledgers • Stockholders Ledger • Operating Statements

There's a new standard of accounting efficiency in many utility offices today. It's a standard made possible by a completely new idea in mechanized accounting—the revolutionary new Burroughs Sensimatic with the "mechanical brain" that directs it automatically through every accounting operation.

Here is a new accounting machine with amazing versatility, speed and ease of operation. The Burroughs Sensimatic does a wide variety of accounting jobs with a saving of time, money and effort over former accounting methods. Just a turn of the job selector knob moves it speedily from one posting job to the next.

Find out today how the Burroughs Sensimatic can save working hours, reduce your accounting costs, and increase efficiency. And all at a surprisingly moderate cost, too. Call your local Burroughs office or write for complete facts today. Burroughs Adding Machine Company, Detroit 32, Michigan.

WHEREVER THERE'S BUSINESS THERE'S **Burroughs**

FOR DEPENDABLE MANUAL OR REMOTE CONTROL OF

capacitors . . .
street lighting . . .
airport lighting . .
flood and other
outdoor lighting . .
sectionalizing . . .

L-M KYLE OIL SWITCHES

KYLE Type GR Motor-driven Remote-Control Oil Switch
100 amperes, 15,000 volts

The manually operated type G looks the same except for the separately housed motor-control mechanism on the left side. Total height including bushings, 18½"; tank, 7⅛" diameter. Hangers for direct pole or crossarm mounting.

● L-M's KYLE oil switches are available in manual control type G, in electric remote control type GR, and in the new three-pole manually operated types 1G, 2G, and 3G shown at right.

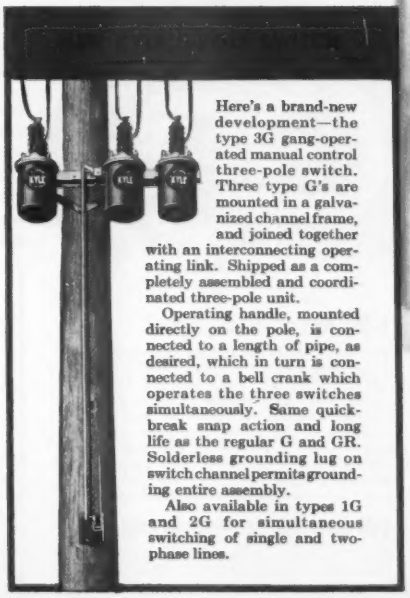
They are sturdy, dependable, economical; they provide many features that make them most desirable for a variety of light-duty load-break operations within their 15 kv 100 ampere rating.

KYLE switches provide fast operation. Contacts are fully open in less than a cycle. Double copper-tungsten contact tips minimize burning and pitting, assuring long life. The switches are light in weight, easy to install. Cost is moderate (G costs less than $37!); and they give long, dependable service. They are safe to use. The mechanism is insulated from the tank; head and operating handle are electrically dead. The only live parts are the top bushing terminals.

Type GR with Electric Control—The remote-control type GR has a shaded-pole 115-volt 60-cycle AC motor with control and selector switch to open or close the switch. It may also be operated manually if desired. There are no magnets requiring continuous current—the switch uses power only during actual opening and closing. Three single-phase type GR switches may be connected for simultaneous remote switching of three-phase circuits.

There's nothing to stop you from getting full information . . .

Ask the L-M Field Engineer for details and a copy of this inclusive Bulletin CR2 on oil switches; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



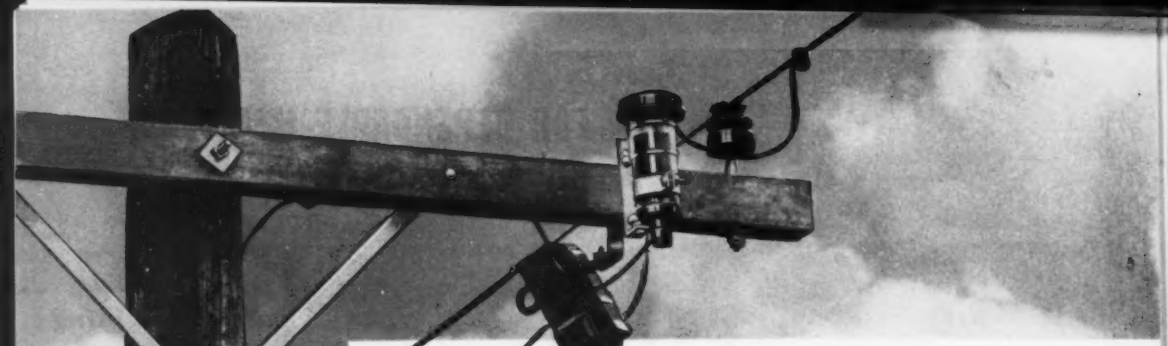
Here's a brand-new development—the type 3G gang-operated manual control three-pole switch. Three type G's are mounted in a galvanized channel frame, and joined together with an interconnecting operating link. Shipped as a completely assembled and coordinated three-pole unit.

Operating handle, mounted directly on the pole, is connected to a length of pipe, as desired, which in turn is connected to a bell crank which operates the three switches simultaneously. Same quick-break snap action and long life as the regular G and GR. Solderless grounding lug on switch channel permits grounding entire assembly.

Also available in types 1G and 2G for simultaneous switching of single and two-phase lines.

5R

LINE MATERIAL Kyle Oil Switches



Another Example of L-M Leadership

L-M's ORTO

(Oxidation-resistant transformer oil)

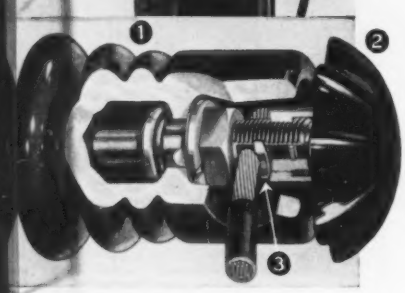
gives you all these advantages:

- longer life for the transformer, with the same overload capacity, or . . .
- higher overload capacity with the same transformer life
- reduced oil acidity and sludging
- maintained high impulse strength

and

- ORTO mixes with any other oil, conventional or inhibited
- ORTO will not react with other inhibitors
- ORTO is available as a *concentrate* for adding to your present oil stocks, for adding to power transformer oils, and for prolonging the life of reclaimed oil

Since its announcement, which led the industry, ORTO® has been a phenomenal success. Naturally L-M and L-M research engineers are gratified by ORTO's acceptance and this acceptance was deserved, by the long, rigorous careful checking into oils and inhibitors. New accelerated test methods were developed, to make sure that ORTO was as good as expected. ORTO was thoroughly tested and proved by extensive investigation and accelerated life tests representing many years of service.

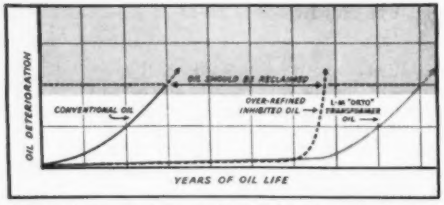


L-M'S NEW SIDEWALL BUSHING

For fast, permanent transformer connections. Heavy machined wet-process porcelain (1) with ample leakage distance. Extra strong finger-grip handle (2). Lineman inserts bared end of conductor into the connector (3), spins the knob tight. Hole only on one side of bushing; wire can't go through to snag clothes or cause accidental contact. Leak-proof, inherently siphon-proof; takes up to two full-size conductors.

L-M DISTRIBUTION TRANSFORMERS

Available in sizes up to 500 kva, voltages from 480 to 14,400, all ORTO-filled. Dry types 1½ to 50 kva, 600/120-240 volts.



Comparative curves show the deterioration of transformer oil in service. A high-grade conventional oil deteriorates at a gradually accelerating rate. Over-refined oils may have a better response to the inhibitor; but once the inhibitor has been used up, the oil has little resistance to oxidation, and deteriorates rapidly. ORTO brand oil is a high-grade conventional oil with an inhibitor which greatly extends the beginning of the deterioration, which, when it finally starts, assumes the same gradual curve as with any high-grade conventional oil.

Ask the L-M Field Engineer for information on ORTO; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

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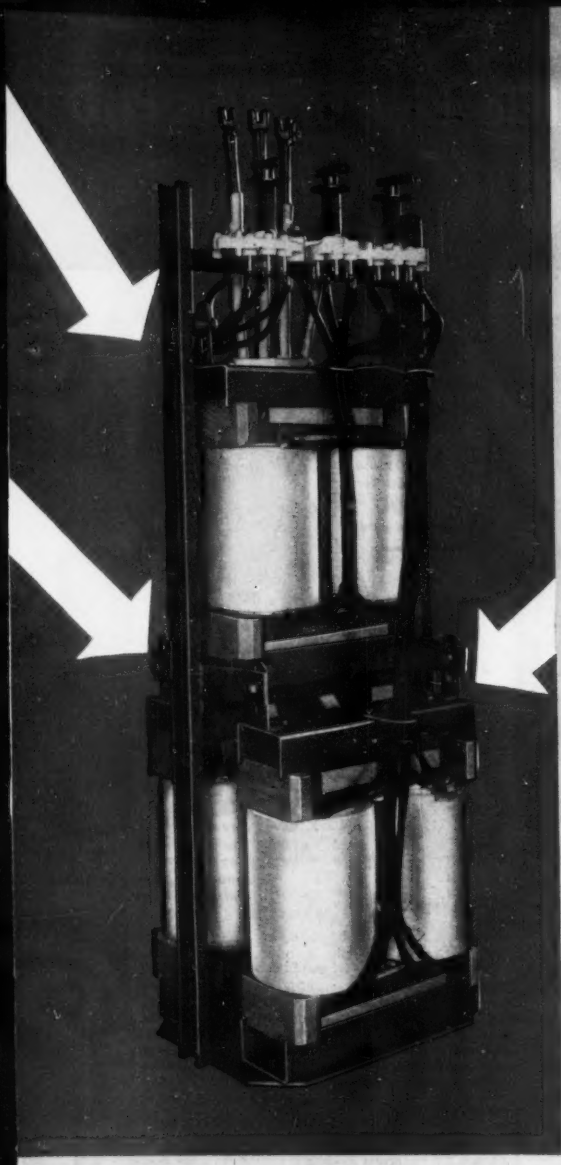
LINE MATERIAL . . . Transformers

Complete Coordinated Equipment for Distribution Today



It's easy to replace any one unit in L-M 3-PHASE ROUND WOUNDS®

L-M Round-Wound transformers have exceedingly high impulse strength and overload capacity so that burnouts are extremely rare. But if a coil *should* burn out, you don't have to replace the whole transformer. The core-coil assembly from any one phase is simply removed from the rack and a replacement unit quickly installed.

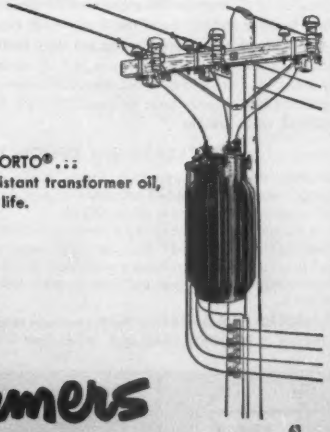
It's as simple as that, and almost as quick . . . whether it's done in your own shops or in one of the authorized L-M Transformer Service Shops near you.

Under emergency conditions you can restore service in a hurry because with L-M construction you can connect two units in open wye or delta.

Besides the advantages of rapid core-coil replacement and fast service restoration, L-M 3-phase transformers give you all the desirable Round-Wound performance features . . . with the wound core that isn't cut or disturbed in any way after annealing . . . with the round coils wound right onto the core. An L-M "exclusive!"

Get the whole story. Ask the L-M Field Engineer or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

Three single-phase core-coil assemblies, one above and two below, for simplified mounting and best cooling. Rigidly held in strong channel-steel frame which fits into steel channels welded inside tank wall.



Now furnished with ORTO®... L-M's oxidation-resistant transformer oil, inhibited for longer life.

LM®

LINE MATERIAL Transformers

Complete Coordinated Equipment for Distribution Today

Here is L-M's complete line of type PHD
5 KV HEAVY DUTY CUTOUTS

8000 amperes interrupting capacity for 50 ampere cutout
14,000 amperes interrupting capacity for 100 ampere cutout
20,000 amperes interrupting capacity for 200 ampere cutout
1. standard duty door—1200 amperes interrupting capacity
2. heavy duty door—8000-5000 amperes interrupting capacity
3. switch blade door—100 amperes continuous current rating
4. standard duty door—3000 amperes interrupting capacity
5. heavy duty door—14,000-10,000 amperes interrupting capacity
6. switch blade door—200 amperes continuous current rating
7. heavy duty door—20,000-15,000 amperes interrupting capacity
8. switch blade door—400 amperes continuous current rating

Up to 20,000 amperes interrupting capacity
Interchangeable Doors—standard, heavy duty, and switch blade types—in each rating
50 and 100 ampere doors fit your present PVD® cutouts

Here is the first and only complete line of cutouts for high power capacity distribution feeders. These cutouts provide extra high interrupting capacity *as you need it*, without the extra cost for needless high *continuous* current rating. You can install one of these new L-M cutouts with standard duty door. As feeder load requirements change and fault currents increase, you can change it to a heavy duty cutout, in just six seconds, by hooking on the heavy duty door. Or change it to a disconnect switch—either stationary or indicating. Or you can change over your *present* PVD's! Warehousing and stocking are simplified, costs are cut.

PHD is a Line Material Co. trademark.

OUTSTANDING DESIGN FEATURES

- Housings wet-process porcelain, glazed inside and out.
- Hanger supports cemented into back of porcelain housings.
- All current carrying parts silver plated.
- New clamp type terminals with easily accessible large-head screws.
- Replaceable "bakelined" fuse cartridge tubes resist weathering and arcing.
- Spring-actuated flip-out device pulls fuse link down and out of tube, assuring instant separation of link parts, even with the smallest links, and low fault currents.

ENGINEERED FOR SAFETY—The lineman can remove the door completely, re-fuse and replace it, all with a switch stick. When door is open, all door parts are dead.

400 ampere disconnect switch in indicating position
Through the use of this new, higher-rated switch blade, the 200 ampere cutout can now be converted simply and quickly to a 400 ampere disconnecting switch for use on higher nominal current systems. Door can be closed with hinged blade in disconnect position below the box, giving positive indication that the line is open—a unique L-M feature.

L-M HEAVY DUTY CUTOUTS

RATING	DOORS AVAILABLE	INTERRUPTING CAPACITY rms amperes 2.5 kv*	5 kv**
50 AMPERES	1. Standard duty, indicating	1,200 amp.	1,200 amp.
	2. Heavy duty, non-disconnecting	8,000 amp.	5,000 amp.
	3. Switch blade	100 amperes continuous current rating.	
100 AMPERES	4. Standard duty, indicating	3,000 amp.	3,000 amp.
	5. Heavy duty, non-disconnecting	14,000 amp.	10,000 amp.
	6. Switch blade	200 amperes continuous current rating.	
200 AMPERES	7. Heavy duty, indicating	20,000 amp.	15,000 amp.
	8. Switch blade	400 amperes continuous current rating.	

* or line-to-neutral 4160 or 4330 volts Gr. Y. ** or line-to-neutral 8330 volts Gr. Y.

GET THE WHOLE STORY—Ask the L-M Field Engineer for complete information, and copy of Bulletin on PHD Cutouts; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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LM

LINE MATERIAL . . . fuse cutouts

Complete Coordinated Equipment for Distribution Today

Now you get DOUBLE holding power

L-M Guy Clamps with TORKOL-Treated Nuts

Work Faster, Easier!

Now you can use *one* guy clamp where you formerly used two! Tests show that with Torkol nut lubricant—an L-M "exclusive"—wrench torque develops twice the normal holding power of an untreated clamp. High strength, heat-treated bolts assure plenty of extra strength.

THESE TESTS TELL THE TORKOL STORY

Recent tests compared the holding power of Torkol-treated 3-bolt clamps with untreated 3-bolt clamps. The pull required to produce ⅛-inch slip of the guy strand was measured for a wide range of wrench-torque values. Results were plotted into comparative "Nut-Torque vs. Holding Power" curves shown at the right.

SEE WHAT A DIFFERENCE!

To hold a pull of 7000 pounds, using ⅜" high strength guy strand and clamps with ⅝" dia. bolts, required the following nut torques:

with *un*treated clamps, 120 foot-pounds torque;

with Torkol-treated clamps, 52 foot-pounds—less than half as much!

The extra holding power of L-M Torkol-treated guy clamps often permits the use of a clamp with smaller bolts. For example: With 3-bolt clamps with ⅝" bolts, on ⅜" HS strand, with 90 foot-pounds of torque:

*un*treated clamp held a 5800-pound pull;

Torkol-treated clamp held 12,400 lbs.

With a 3-bolt clamp with ½" bolts:

*un*treated clamp held a 3800-pound pull;

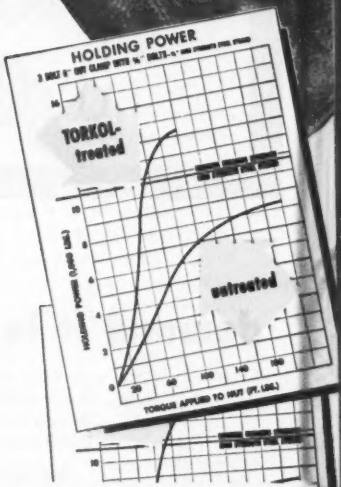
Torkol-treated clamp held 9700 pounds.

The Torkol-treated clamp with ½" bolts held 3900 pounds more than the untreated clamp with ⅝" bolts! The possible savings are obvious.

SERVES YOU BETTER—COSTS NO MORE

With L-M Guy Clamps, you save on material, cut installation time, and get far better strength-balance in the whole guying installation. What's more, Torkol-treated L-M clamps contribute to worker-safety, for they seldom require heavy muscular effort with its risks of straining and danger. *And L-M Torkol-treated clamps cost you no more!*

Torkol is a Line Material Trademark



GET THESE NEW FACTS ON "TORKOL"

Want a complete set of these new Torkol test curves? Eight charts cover the guy-strand range from ¼" to ½"—and permit coordination of guy clamp holding strength with that of other components. Ask your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

L-M Guy Clamps are made in styles from one to four bolts, of heavily galvanized steel. Smooth grooves with rounded edges prevent strand damage. The high-strength bolts may be inserted from either side.

All nuts are Torkol-treated—identified by their yellowish color. They go on quickly, stay tight, unscrew easily, may be reused. Clean. Dry. Unaffected by weather or weather changes.

LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today

Proof of Performance

demand it in your wood preservative, too

Proof—not just a promise—is available to help you judge the effectiveness of Creosote Oil as a wood preservative. Service records that date back as far as the 1880's testify to its ability to extend the service life of wood.

And service records, after all, are the only conclusive method of judging a preservative. They take into account every factor that affects the life of wood—weather, sunlight, moisture, temperature, air and food conditions.

U·S·S Creosote Oil has undergone extensive service tests . . . has proved time and again that it has the characteristics necessary to give the maximum life to treated wood.

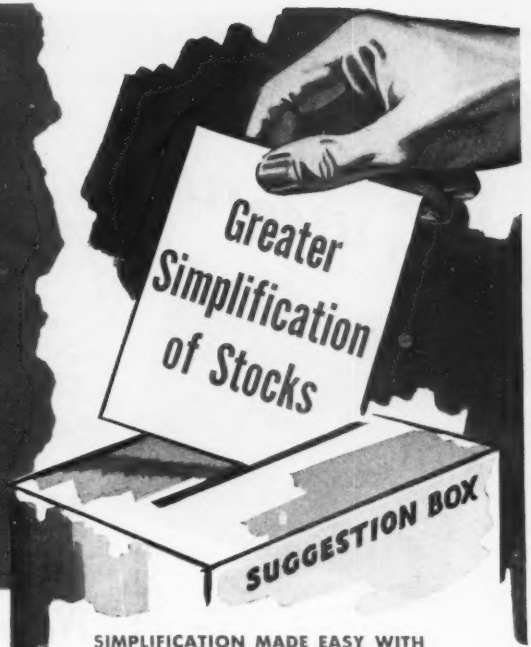
U·S·S Creosote Oil is available for immediate shipment to you by rail or river from the world's biggest tar distillation plant at Clairton, Pa. For complete information, contact our nearest sales office or write directly to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.

USS

U·S·S CREOSOTE OIL

UNITED STATES STEEL

GOOD IDEA FOR CUTTING HIGH COST OF INVENTORY MAINTENANCE



Taxes, insurance, rentals, freight, storage, building maintenance, purchasing and accounting operations . . . all are costs of maintaining your inventory of materials and supplies.

In dollars and cents, these costs will range from 5% to 30% of inventory value, depending on local conditions under which you operate. For example, if you purchase $1,000,000 worth of materials and supplies a year, at 10% it costs you $100,000 a year just to maintain this inventory.

Today, to help offset the effect of rapidly mounting operating costs, many utilities are reducing the cost of inventory maintenance through further standardization and simplification of stocks.

If you're one of these, Locke can help you.

SIMPLIFICATION MADE EASY WITH LOCKE'S *RM HANDYLOG

It's the perfect tool for men working toward further simplification of Pole Line Hardware stocks. It lists ONLY the standard items which you need. By using it, you stock fewer items. Each item is a fast mover. Each is regularly in production, and carried in stock by your Locke Regional and Distributors' Warehouse. If you haven't got a copy of Locke's *RM Handylog, write for one today. Place the items in it on your standards list. Do this and you'll be taking the industry's only practical short-cut toward further standardization and simplification of Pole Line hardware stocks. Locke Department, General Electric Company, Baltimore, Maryland.

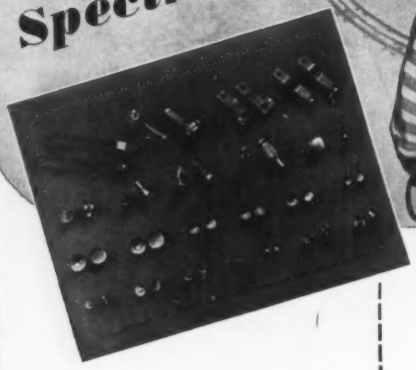
*RM (Repetitive Manufacture) *A program designed to help reduce the installed cost per kilowatt on line and station equipment.*

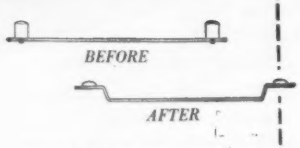
The industry's only guide to reduced inventory maintenance costs through simplification of Pole Line Hardware Stocks.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Before you buy stop! **See what Locke can get!**





MALLORY SILVER CONTACTS

Fine and coin silver, while having desirable properties for many applications, do not provide the physical properties required for some applications. To cover these applications, Mallory has developed a series of silver base alloys. These alloys have such improved characteristics as greater resistance to wear, less sticking or metal transfer, and greater hardness. Mallory is fully qualified to recommend the best contact material for your design. Write today.

Mallory Engineering *Suggests New Contact Assembly ...Saves Customer Money*

Hundreds of customers are profiting from Mallory contact know-how which simplifies design and production, saves valuable time and money.

A manufacturer of electric toy trains submitted a contact assembly job to Mallory which called for large silver contacts on a flat section of spring steel. Mallory suggested a re-design of the part enabling a great reduction in the size of the silver contact and utilizing a Mallory-developed welding technique to insure maximum mechanical strength. The customer was given improved performance . . . at a substantial saving!

That's result beyond specification!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you!

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO. Inc.

MALLORY

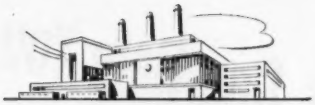
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

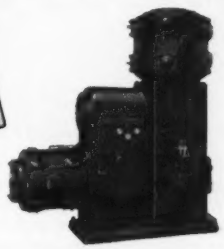
Metallurgical Products
Contacts *Special Metals*
Welding Materials



Here's REAL ECONOMY in AIR POWER for POWER PLANTS

Ingersoll-Rand can supply the right compressor for ALL THREE power plant applications

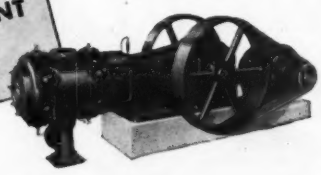
1. GENERAL SERVICE AIR



XLE Compressors

This new, compact, packaged-design, electric-driven compressor sets new standards of performance and economy in supplying general service air for power plant use. It's a heavy-duty, completely self-contained, two-stage unit producing pressures of 80 to 125 psi. The new "L" Design—with Pipeless Thru-Frame Air Flow, built-in tube-and-finned intercooler, and crankshaft-mounted synchronous motor—saves floor space, cuts installation cost and reduces maintenance.

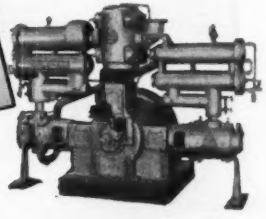
2. INSTRUMENT AIR



ES-NL Compressors

The famous I-R Class ES compressor—with NL (non lubricated) cylinder—is the most dependable and efficient source of oil-free air for operating pneumatic control instruments. The heavy-duty ES compressor meets the most exacting requirements for instrument air systems, where dependability and continuity of service are essential. The NL cylinder is fitted with graphitic carbon supporting and pressure rings, requiring no oil, grease, water, or glycerine for lubrication.

3. SOOT BLOWING



TVH Compressors

This three-stage compressor, with discharge pressures of 350 to 500 psi, has been especially developed for heavy-duty soot-blowing service. Inverted "T" design, with self-contained interstage cooling, assures high over-all efficiency, low discharge temperatures, and smooth running balance. Floor space requirements are reduced and easy accessibility of all parts simplifies inspection and maintenance. Available with direct-connected motor drive.

● All of these compressors have one thing in common—Ingersoll-Rand's traditional dependability and performance. That's your best assurance of minimum operating and maintenance expense, with important long-term savings that mean real economy in air power equipment. Your nearest I-R representative will be glad to give you complete information on the compressors best suited to your needs.

694-1

Ingersoll-Rand

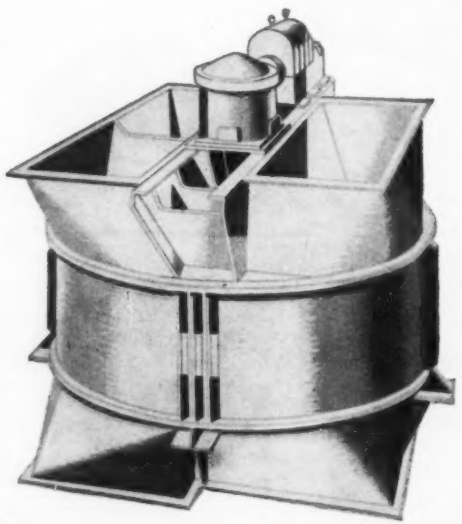
11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

The Ljungstrom Air Preheater Can Help You

1. To improve combustion of low-grade fuels
2. To raise the level of heat recovery
3. To save materials in plant design

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.



If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

We Gain TWO WAYS

with Westinghouse Induction Regulators

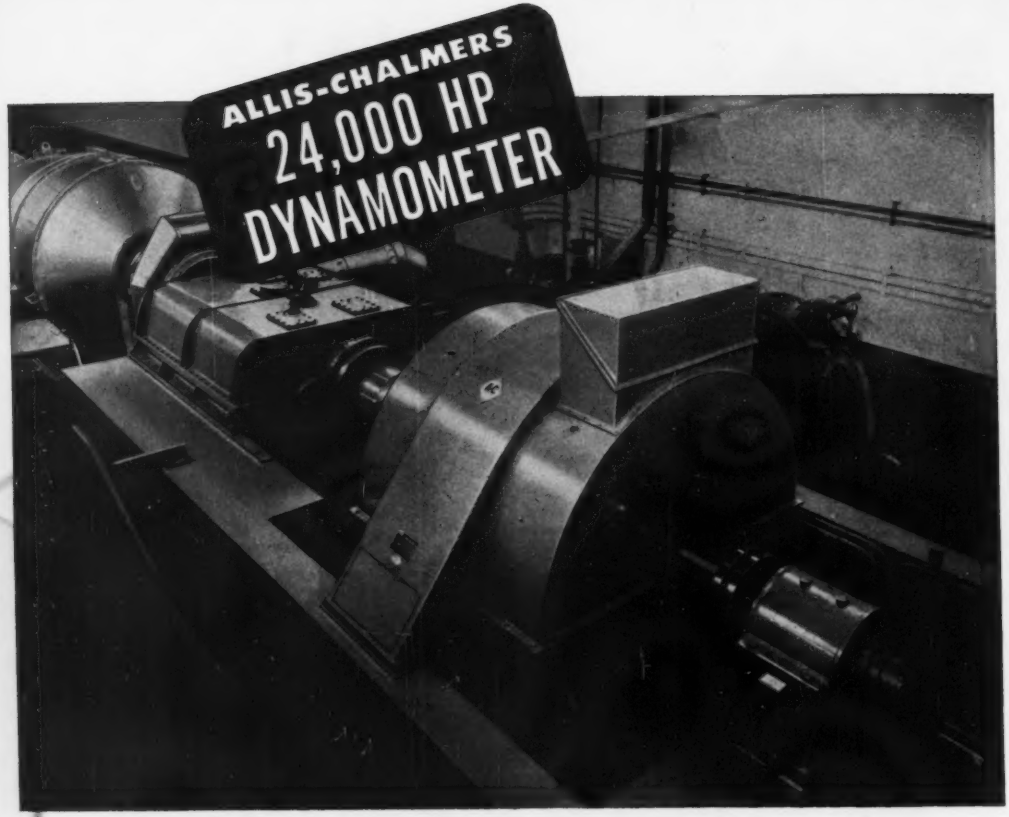
Westinghouse Induction Regulators installed at urban substations give double duty. They're dollar *makers* and dollar *savers*. They assure maximum revenue by faithfully delivering adequate and sustained voltage. They cut regulating costs because Westinghouse design provides sure operation with minimum maintenance.

New electrical controls simplify adjustments over the complete range of balance voltages and band widths. Dependable settings are simply a matter of turning dials . . . as easy as tuning in a radio. The voltage level setting is accurately calibrated, permitting adjustment without disturbing the line-drop compensator. Either may be adjusted without interrupting the operation of the regulator.

Sturdy regulator construction assures long, trouble-free life. All relay moving elements are mounted on stainless steel spring hinges. Thus, maintenance inherent with bearings is eliminated. Metallic contact of the pole faces on the motor-operating relay has been entirely eliminated by use of the spring-supported, snap-action element, making it impossible for the relay to stick because of residual magnetism.

Westinghouse Induction Regulators are available in three types, to meet all urban station requirements . . . your choice of oil-cooled, air-cooled or inerteen-cooled construction. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-10371

YOU CAN BE SURE...IF IT'S
Westinghouse
VOLTAGE REGULATORS



Another Example of Allis-Chalmers Engineering

DESIGNING AND BUILDING this special power-delivering dynamometer required engineering skill available only to a company such as Allis-Chalmers with its century of engineering experience.

Arranged for direct measurement of torque, the dynamometer has an accuracy of ½% of the rated torque. Its overall speed range is 1210 to 15,072 rpm. And the 24,000 hp synchronous motor and its speed-increasing gear are supported by a special hydrostatically mounted base. Although the assembly weighs 130,000 pounds, it is so well balanced and cradled that it can be moved by the pressure of a man's finger.

The dynamometer was built for the Pratt & Whitney Aircraft Division of United Aircraft Corporation for testing turbo-jet engines. Allis-Chalmers also supplied the torque measuring equipment, metal-enclosed bus duct and switchgear.

Whether you need special or standard equipment—for power generation, distribution or utilization — you can benefit from this engineering experience by calling your nearby A-C representative. Allis-Chalmers, Milwaukee 1, Wis.

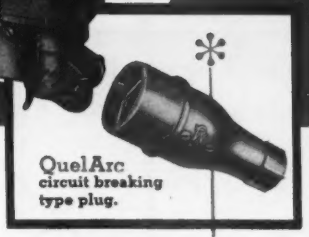
A-3501

ALLIS-CHALMERS

Heavy Duty Safety Switch, and Circuit Breaker

RAIN-TIGHT! DUST-TIGHT!

PYLETS



QuelArc circuit breaking type plug.

Designed for Safe, Reliable Operation and Protection of Portable and Stationary Electrical Equipment, indoors and outdoors, under the most severe operating conditions

MUCH LONGER SERVICE LIFE AND LOWER MAINTENANCE COSTS insured by heavy, rust-resisting cast metal construction and rain-tight gasket seals.

COMPLETE SAFETY FOR THE OPERATOR is provided by safety circuit grounding and the interlocking of door and plug receptacle with a quick make and break switch mechanism.

PYLE QuelArc plugs, used with this equipment, are well known industrially, for their unique partitioned construction. Long insulating surfaces from pole to pole, and from poles to ground provide for exceptionally safe handling and long service life.

Consult your Pylet Catalog, Bulletin 1150 for complete listings.

SINCE 1897

THE PYLE-NATIONAL COMPANY
1385 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

District Offices and Representatives in Principal Cities of the United States
Export Department: International Railways Supply Co., 30 Church St., New York.
Canadian Agent: The Holden Co., Ltd., Montreal.

PLUGS AND RECEPTACLES • FLOODLIGHTS • TURBO-GENERATORS • GYRALITES • CONDUIT FITTINGS • MULTI-VENT AIR DISTRIBUTION

The Tougher the Job . . .

the more we can help. For Hoosier engineers are more experienced in handling the erection and maintenance jobs that have proved unusually difficult for utilities throughout the country. Hoosier engineers, trained men and special equipment are available at any time to supplement your own organization or work independently.

ERECTION AND MAINTENANCE OF TRANSMISSION LINES

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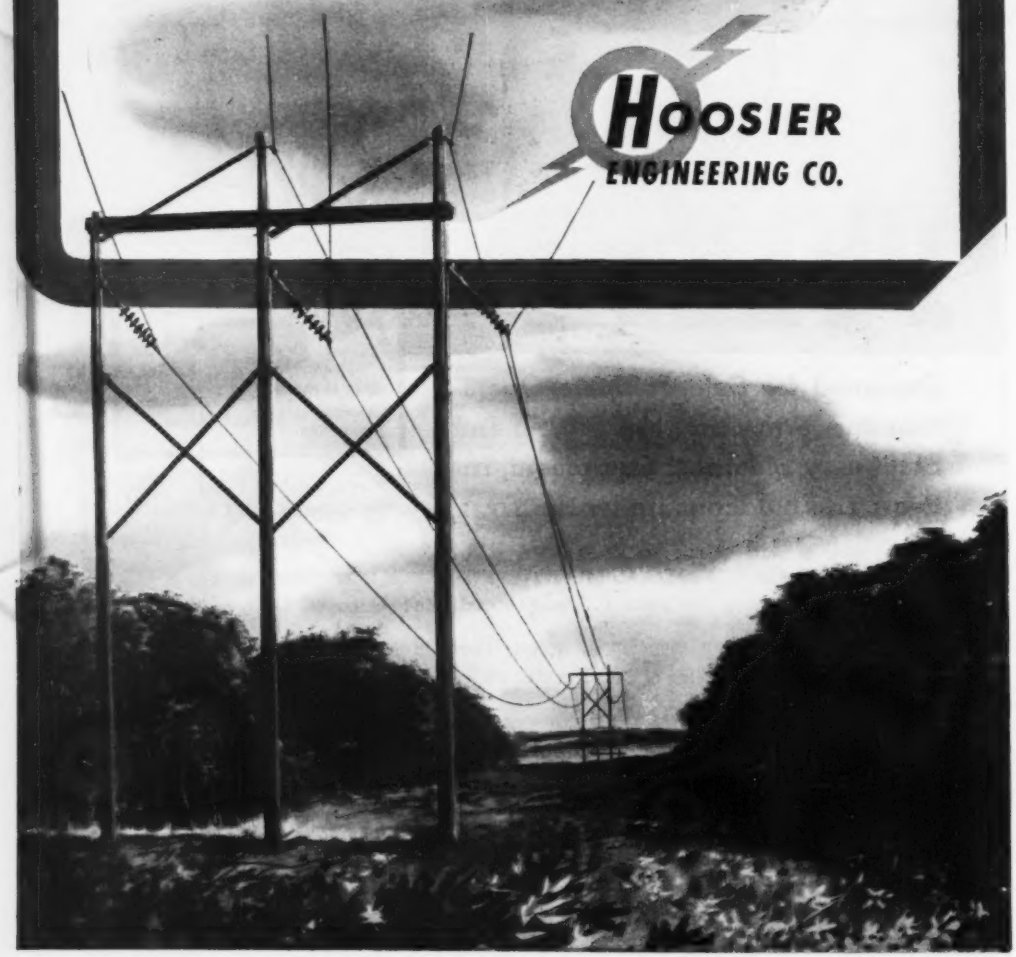
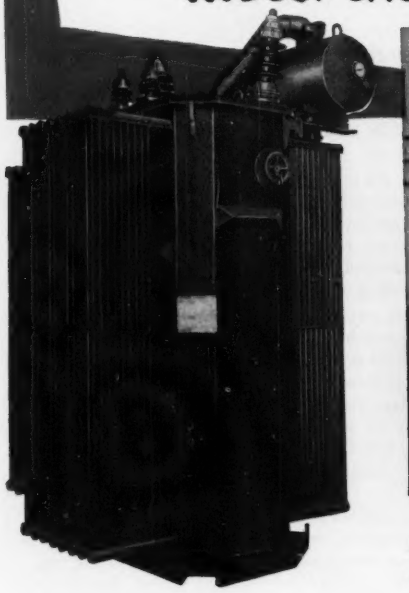
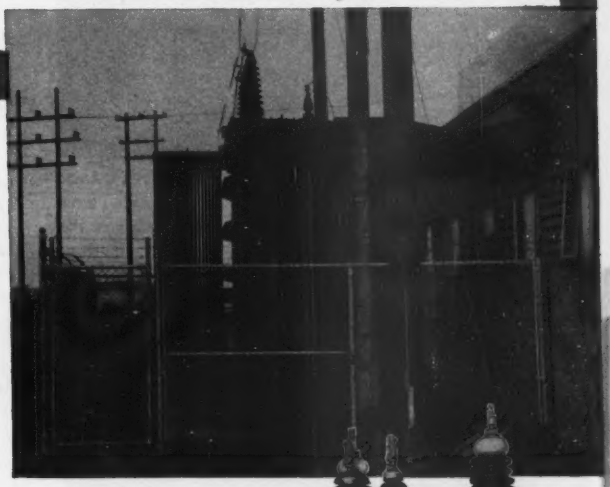
HOOSIER ENGINEERING CO.



Wagner Transformers

...best choice for Rural Systems





7500 kva, three-phase Wagner Power Transformer in the substation of a generating co-op in the Northwest.

. . . They have the stamina to perform dependably under ever-increasing loads

Wagner Transformers are favorites with hundreds of rural line systems throughout the country. Whether you need power transformers for generating plants—substation transformers for feeding distribution lines—or pole type transformers along the lines . . . you can't beat Wagner Transformers. They require only a minimum of attention, and they have a nationwide reputation for long life and stamina. This reputation is backed by service records from the field and by sixty years of transformer building experience.

Above is a 2000 kva Wagner Power Transformer.

At right is pictured a Wagner single-phase Substation Transformer—like those serving with complete dependability on rural line systems everywhere.

If you are planning to increase the capacity of your system, check the many advantages of Wagner Transformers. Bulletins TU-180 and TU-181 give full information. Be sure to get your copies.

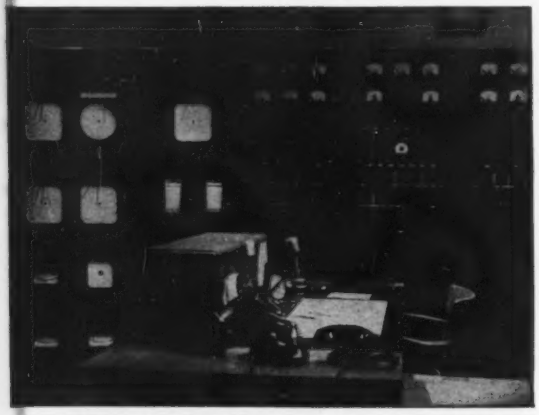
Wagner Electric Corporation
1891 1951

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

METAMETER AT BONNEVILLE AND GRAND COULEE DAMS. Bristol strip-chart Metameters are used by the Bonneville Power Administration. The receivers shown above are installed on the Bonneville dispatcher's board at the H. D. Ross Substation, Ampere, Washington, and record Bonneville 230 KV, Bonneville total power, Coulee total power (transmitted from Grand Coulee Dam approximately 250 miles away), and system total power.



METAMETER AT ROCKLAND LIGHT AND POWER COMPANY, MIDDLETOWN, N. Y. The 15 Metameter indicating receivers at right show kilowatts, water levels and kilovars at three hydro-electric power plants. The three at left measure and record pressure of delivered gas, and integrate flow into the Company's distribution system at points up to 50 miles away. The other Bristol instruments totalize flow during a given period of time in the three supply lines and also give a continuous reading and a chart record of total instantaneous flow through all three lines.

DISPATCHING MADE EASIER

Bristol Metameter* telemeters give the dispatcher up-to-minute readings of electrical and other measurements made many miles away

A complete and continuous visual picture of what is happening at key points throughout the system enables the dispatcher to accurately appraise conditions instantly and act with full knowledge.

With information from his Metameter receivers, he can keep in touch with load changes and direct the generation and transmission of power more economically and with greater ease. He can foresee emergencies and take the necessary steps to maintain schedules. Often, he can increase safe maximum loads in tie lines considerably.

Among the types of information Bristol Metameter telemeters make available to the load dispatcher are: the load at each tie-line point, output of each generating station, totalized output (on one instrument) of all generating stations, active and reactive power and power demand at key points, voltage and current at various points.

Generating stations use Metameter for information on output of each associated station (attended or unattended), total output, water level and water wheel gate position, water level in reservoirs, surge tanks, etc.

Readings can be transmitted any distance, over any two-wire circuit or its equivalent, carrier-channel, telephone, telegraph or radio (including microwave) . . . to recording receivers (narrow or wide-strip chart or round chart) or indicating receivers.

Metameter is the tried-and-proved telemetering system. Thousands are in use on all types of service. Write us for Bulletin M1700. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

Reg. U. S. Pat. Off.

BRISTOL

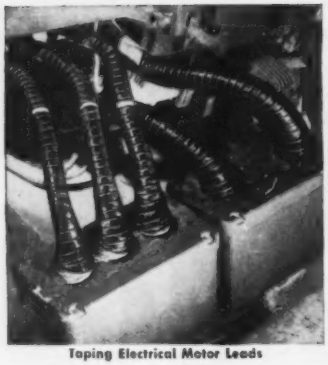
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

TESTS TEN TIMES GREATER THAN NORMAL!

Your lines are never likely to experience loads such as Porcelain Products Suspension Insulators are put through in gruelling tests to prove their stamina. Recent time-load tests on our Suspension Insulators for one of the large Utility companies followed the current NEMA Standards pattern up to the application of the 10,000 pound load. The **really gruelling test** went on from that point for a period of ten days as compared to the standard of 24 hours. Every day the standard flash-over with the 10,000 pound load still applied was made. At the end of the time-load test each insulator was given the standard 15,000 pound combined M&E test, passing without failure. You can count on Porcelain Products Suspension Insulators giving maximum performance on your line.

Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA



Taping Electrical Motor Leads

Splicing Leads on Control Switch

Taping On Lead-in Switch

DUTCH BRAND PLASTIX ELECTRICAL TAPE

... for hundreds of special uses

Neat Splicing for Limited Space

DUTCH BRAND PLASTIX meets those many special requirements for a superthin conforming tape with high dielectric resistance for use where space is limited. PLASTIX has great flexibility and stretch . . . it tears readily in spite of its strength and it resists weather, oil, acids, alkalies and corrosion.

It is available in the regular .007" gauge for general service or .010" gauge for heavy duty work. Dielectric resistance is more than 1000 volts per mil of thickness.

Specify DUTCH BRAND the next time you order.

Application in Junction Box

also

DUTCH BRAND Friction and Rubber Tapes

AVAILABLE AT YOUR JOBBERS

DUTCH BRAND

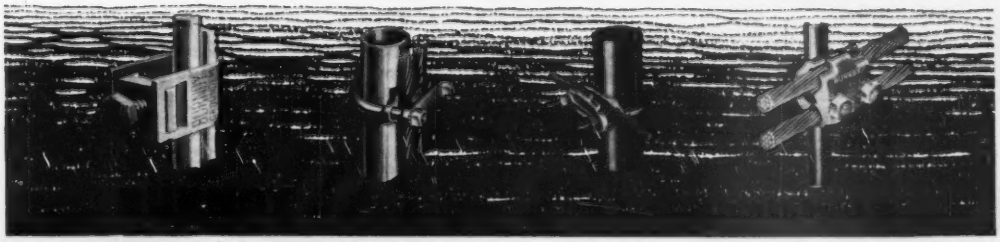
VAN CLEEF BROS. INC.

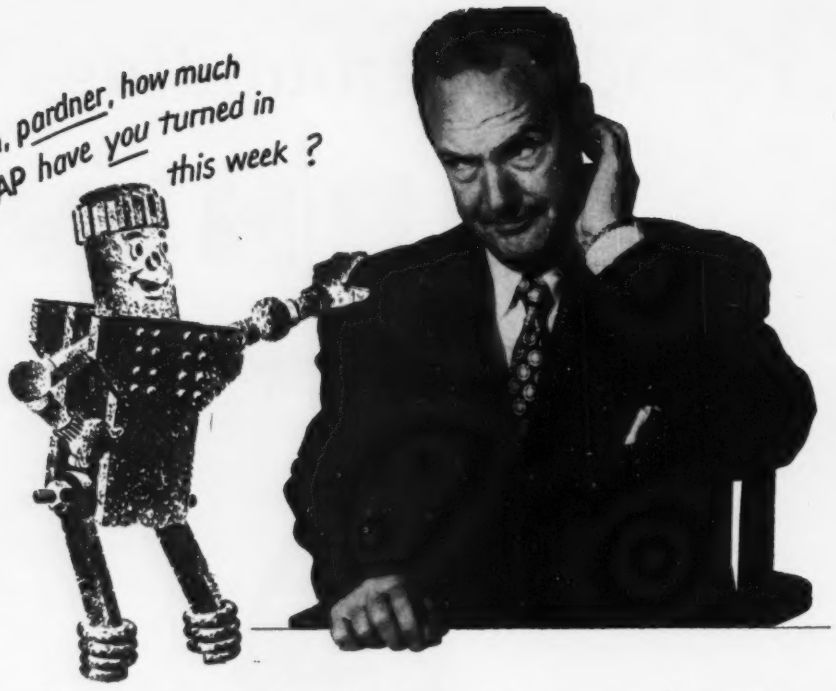
Manufacturers . . . Rubber Products . . . Est. 1910

7800 WOODLAWN AVENUE • CHICAGO 19, ILLINOIS

for modern grounding – see

BURNDY





Today, the steel business is your business

—*it needs all your SCRAP, Now!*

SUPPOSE that every steel user were suddenly told that he had to turn in a half-ton of scrap before he could get a ton of steel. It would start the most gosh-almighty treasure hunt for scrap that ever happened.

In effect, this "no-scrap, no-steel" situation virtually exists. For without *all* the scrap that industry can search out and start on its way to the mills, steel production will surely drop. It's as serious as that.

More scrap is urgently needed. Today the mills are turning out more steel than ever before. But they're scraping the bottom of the barrel as far as scrap is concerned. Defense and domestic demands for steel simply cannot be met unless at least 100,000 tons of "purchased" scrap roll into the furnaces—*every day*.

The bulk of this scrap must come from industry. That's why we're asking for your all-out help. That's why it's so important that you make the drive for scrap part of your daily operations. Make it your business to encourage every employee to report any obsolete, broken or worn-out machinery, tool or equipment that has seen its day. From this dormant "junk" must come the heavy melting scrap that the mills need most. Don't let your scrap lie idle; send it on its way. How about it, pardner?

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

USS

1-1326

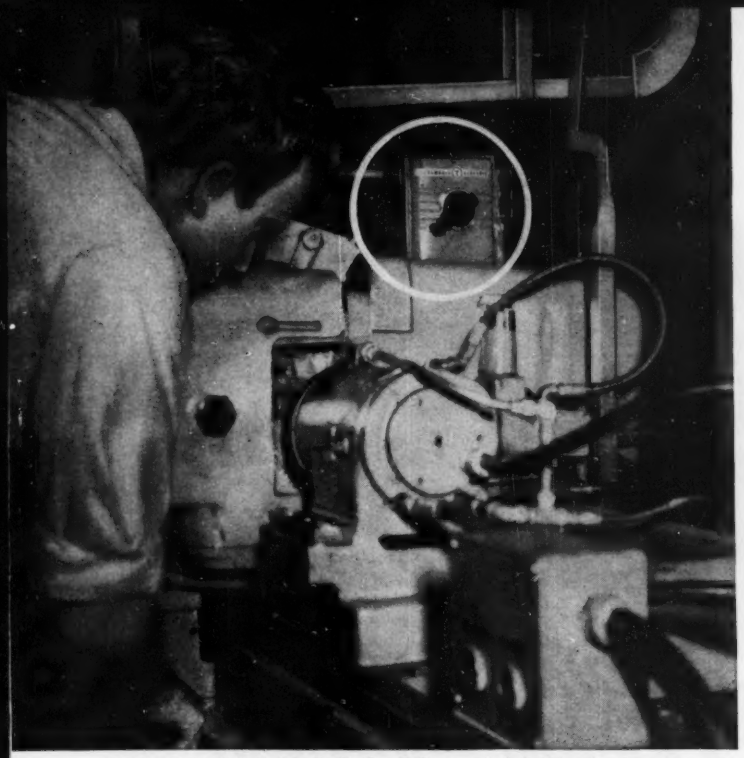
This page would ordinarily be used to tell you about

AMERICAN
ELECTRICAL WIRE AND CABLES

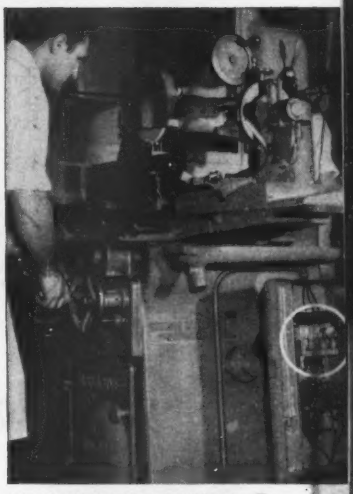
but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL



IN SAFETY SWITCHES—Marlin-Rockwell Corporation's ball bearing factories use 30 ampere HCI switches as disconnects for high frequency motors used to power internal grinders. HCI interior is removable for easy wiring and inspection. No exposed live parts when switch is OFF and door open. Underwriters' Laboratories Approved.



IN COMBINATION STARTERS—Rugged, simple construction of HCI is perfectly adapted to use as disconnect in combination starters.

SAFE LOAD BREAKING

with Unique "Arc-Quench" Action

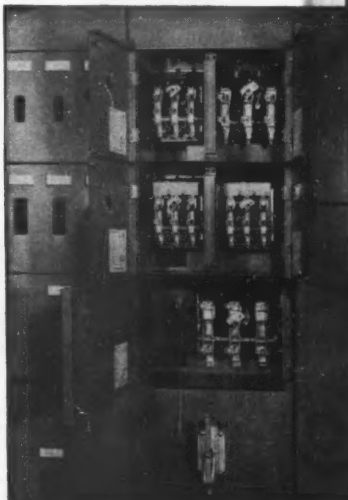
For the first time in a safety switch, magnetic repulsion is used to break load quickly, safely.

In Trumbull's HCI (High Capacity Interrupter) Type A switch, double-break contacts are projected and withdrawn with piston-like speed and force. The arcs repel each other and strike against grid pins, breaking into smaller arcs which cool rapidly.

The unique arc-quenching action provides safety, lengthens contact life by preventing pitting, and gives the switch much greater life expectancy. HCI withstands heavy short circuits without damage.

Its initial success as a safety switch has led to its adoption for use as disconnect in combination starters, control centers and switchboards.

Write for Bulletin TEC-10 which describes the HCI fully.



IN SWITCHBOARDS AND CONTROL CENTERS—Compact 30 and 60 ampere HCI switch interiors can be mounted in twin switchboard units (100 ampere HCI takes same vertical space), saving trough space and providing dependable short-circuit protection and sure ON-OFF handle indication.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLAINVILLE, CONN.

Five important Type V switch features are incorporated in this improved grounding blade.

Now... *Main Switch Design Features* in an improved grounding blade!

Here's the unit that answers your demand for a grounding device that matches main switch performance. For high-voltage switches (above 69 kv) this improved grounding blade incorporates these proved Type V switch features:

1. **Shuntless construction . . . there's nothing to corrode or break.**
2. **Completely enclosed, hinged-end operating arm.**
3. **High-pressure line contacts throughout.**
4. **A minimum of moving parts.**
5. **Oilite bushings for permanent lubrication.**

For complete information write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60752

See "Electrical Proving Ground"... the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details see your Westinghouse representative, or write Westinghouse, Film Division, Box 868, Pittsburgh 30, Pennsylvania

YOU CAN BE SURE... IF IT'S Westinghouse

DISCONNECTING SWITCHES

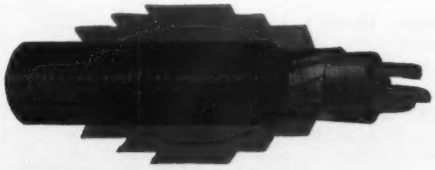
THIS WAY...

Unlike the housewife who uses bread crumbs and other materials to "stretch" the available supply of hamburger, Simplex is not able to add materials to copper to make it go further. We do achieve the same result, but by an entirely different means. Our way is to insulate the copper with Simplex-Anhydrex XX high voltage insulation. It is the very best "copper extender" that we know.

Simplex-Anhydrex XX is a product of Simplex research and development. It is an insulation that is absolutely "tops" in the high voltage field. It is designed to operate at a maximum of 167° to 176°F. (75° to 80°C.) copper temperature, depending on operating conditions. It has all the properties you want in such a high voltage rubber insulation. It will withstand heat. It also withstands ozone and aging, and it is guaranteed not to absorb more than 15 milligrams of water per square inch of exposed surface when tested in accordance with U. S. Coast Guard standards.

So far as we know it is the only insulation of its kind. Use it wherever you have a high voltage problem, whether the cables are to be installed directly in the earth, underground in ducts, under water, or overhead supported from messenger wire.

You can help to "s-t-r-e-t-c-h" the small available supply of copper by insisting that your high voltage cables be insulated with Simplex-Anhydrex XX insulation. Do you want to know more about this unique insulation? Then fill in the coupon below.



SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:

NAME_____ TITLE_____

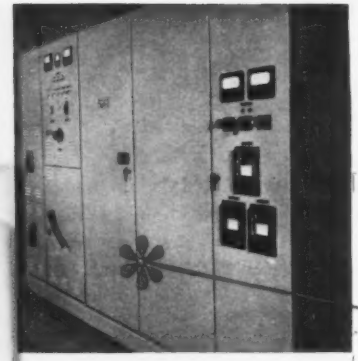
COMPANY_____

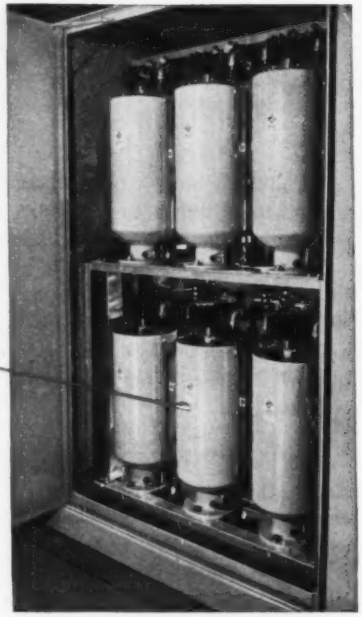
STREET_____

CITY_____ STATE_____

Don't build around obsolete DC supply

—RETIRE IT NOW!





Modern Allis-Chalmers factory packaged, sealed tube, 500 kw mercury arc rectifier as installed in midwestern industrial plant. Left: "dead-front" compartments for dc feeders, dc metering and cathode breaker, rectifier tubes, and ac control and metering. Right: interior view of mercury arc rectifier tube compartment.

NOW IS THE TIME to retire obsolete converting and generating equipment. As operations expand, this inadequate equipment will become a growing handicap.

Now too — while there is a favorable base for amortization — is the time to consider mercury arc rectifiers for your expansion plans. Let Allis-Chalmers show you how the *modern* mercury arc rectifier can improve your direct current service.

LOW MANPOWER REQUIREMENT. With push-button starting and no synchronizing required, attendants are not needed during normal operation. Downtime for maintenance is reduced with no moving parts to lubricate or wear.

LOW COST OPERATION. Conversion efficiency is higher at all loads with large power savings during light load periods.

CONVENIENT INSTALLATION. Factory packaged, light in weight, and requiring no special foundation, Allis-Chalmers mercury arc rectifiers may be placed right at the load center.

IMPROVED PLANT OPERATION. With dc load center installation, distribution distances are cut, dc feeder losses are reduced, and full voltage is available at production equipment.

Whatever your specific direct current needs, Allis-Chalmers builds suitable and truly modern mercury arc rectifiers to meet them.

Sealed tube rectifiers (as shown above) are supplied in ratings from 200 to 1000 kw for lighter duty service. These are commonly used in large buildings, industrial plants and electric haulage systems. Pump evacuated rectifiers are built from 750 kw to the largest ratings required for heavy duty applications.

An Allis-Chalmers representative will be glad to explain in detail how these modern mercury arc rectifiers will improve the operation of *your* direct current system. Call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3467

ALLIS-CHALMERS A-C **MERCURY ARC RECTIFIERS**

For fast, simple installation

DURASHEATH—*the all-purpose cable*

OVERHEAD

IN DUCTS

IN THE GROUND

Durasheath's* versatility can cut your cable installation costs because: 1—it's so easy to install; 2—you can use the same cable overhead, in ducts and for direct burial in the earth and thereby simplify your inventories.

Durasheath is designed for power and lighting circuits for industrial plants, mines, airports†, housing developments, stadiums, farms and railroad signal systems.

Durasheath is flexible and easy to handle. Its tough neoprene jacket stubbornly resists electrolysis, corrosion, temperature extremes, cutting, abrasion and impact. It is little affected by flame, oils, moisture, as well as most soil acids and alkalies.

Fully Underwriters' Laboratories approved, Durasheath comes in one, two or three conductors for service from 600 to 5,000 volts. For complete details on Durasheath, just ask your nearest Anaconda Sales Office or Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York. 51988

*Trademark

— IN ONE CONTINUOUS RUN!

†When ordered to CAA Specification L-824

the right cable for the job..... ANACONDA®

WIRE AND CABLE

LOW-COST OIL SWITCH for capacitor installations

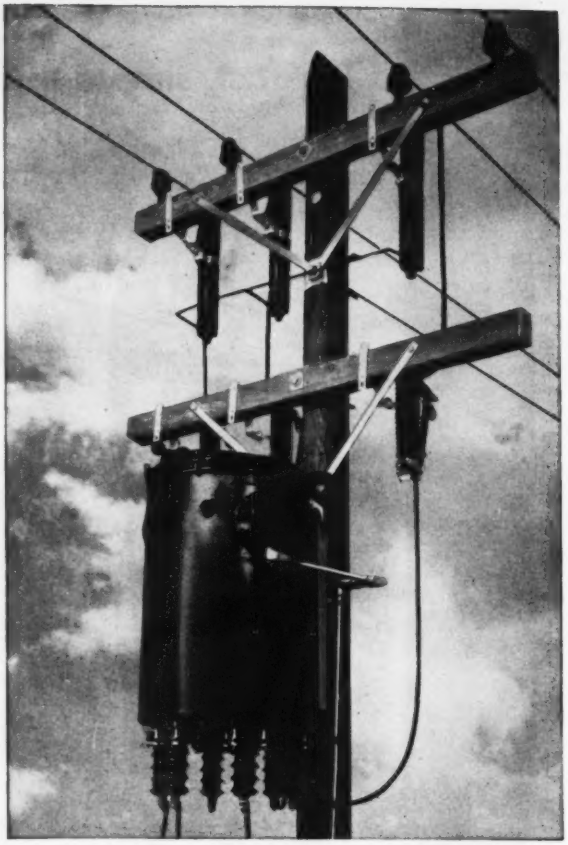
The Type B-1 Capacitor Switch was recently developed by General Electric to reduce the cost of switching capacitor banks. Designed with a high momentary current rating, a long contact life, and the ability to interrupt rated capacitor current without introducing abnormal overvoltages, the switch is being widely accepted. More and more housed capacitor equipments are being furnished with the switch, and a number of switches are being supplied for use with pole-mounted capacitor banks.

Rated 150 amperes, 15,000 volts, three-phase, the B-1 Switch will handle capacitor banks up to these kvars (includes 135% factor as outlined by NEMA).

450 kvar at 2,400 volts
800 kvar at 4,160 volts
900 kvar at 4,800 volts
1,350 kvar at 7,200 volts
2,400 kvar at 12,470 volts
2,700 kvar at 13,800 volts

Contact life—20,000 operations at 150 amp.
Momentary current—40,000 amp. RMS.

Within its maximum rating, this switch is considerably lower in cost than circuit breakers for capacitor equipments.



The B-1 Switch can be actuated by any control circuit which will supply one ampere at 120 volts, 60 cycles. It opens and closes all three phases with a double-break action, using six sets of arc-resisting contacts operating under oil. High-speed closing as well as opening is achieved by a toggle-actuated spring mechanism. A 1/30-hp motor charges the spring in approximately seven seconds. Tank diameter is 21 inches; over-all height, from top of tank to bushing terminal, is 43 inches; weight, including oil, is 500 pounds.

If this switch appears to have possible application on your system, ask for Bulletin GEC-801. A copy can be secured from your G-E Apparatus Sales Office, or by writing General Electric Co., Schenectady 5, N. Y.

407-34

GENERAL ELECTRIC

GIVES YOU

THIS TIMELY TIP—

CLEAN BATTERIES LAST LONGER!

Because battery cleanliness prevents external current leakage and grounds, regularly scheduled cleaning is essential for maximum battery service. Information on proper battery maintenance is available to you through the GOULD PLUS-PERFORMANCE PLAN—a complete system of manuals, articles, specifications, bulletins, charts and graphs dealing with this and practically every other battery problem.

GOULD PLUS-PERFORMANCE PLAN material tells you and shows you how to select, charge and handle, maintain and determine the condition of your batteries . . . and it's FREE, without obligation! Use it and you can extend battery service as much as 50%! Send today for booklet explaining the plan.

Gould Planté—
The Aristocrat of
Stationary Batteries

HERE'S HOW TO CLEAN YOUR BATTERIES

In order to obtain maximum service from stationary batteries, tops must be kept clean and dry. How often they will need this attention depends partly on their location and partly on the care taken to keep liquid no higher than the high level mark. If acid is spilled in any way or if battery is wet on top, neutralize with ammonia or baking soda solution.

Cell terminals can be cleaned with wire brush. Lead plated copper connector or lug contact surfaces may be cleaned with No. 00 sand paper or a suede brush. Never scrape them; scraping can damage the lead plating and expose the copper to corrosion.

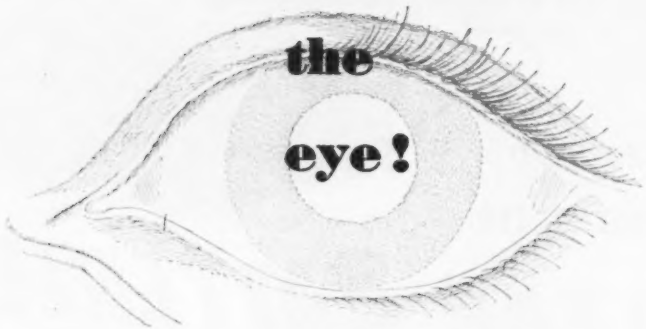
GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

There's more to television than meets the eye!



. . . but *Your Customers Never See It*

When a TV set, or any piece of electronic equipment, leaves your assembly lines, your reputation goes with it. If it works *and keeps working*, with a minimum of service, you build customer good will. If it breaks down, your service costs are high and there's no need to tell you what happens to good will.

To help you build electronic equipment *that lasts*, progressive makers of wire and cable and of molded components build "life insurance" into their products with Fiberglas* insulating materials. For example, lacquered wire made with Fiberglas yarns resists the ravages of heat, rot, even age, far longer than conventional wire. Molded plastic components, reinforced with Fiberglas materials, give you high dielectric strength, plus structural strength never before possible in such constructions.

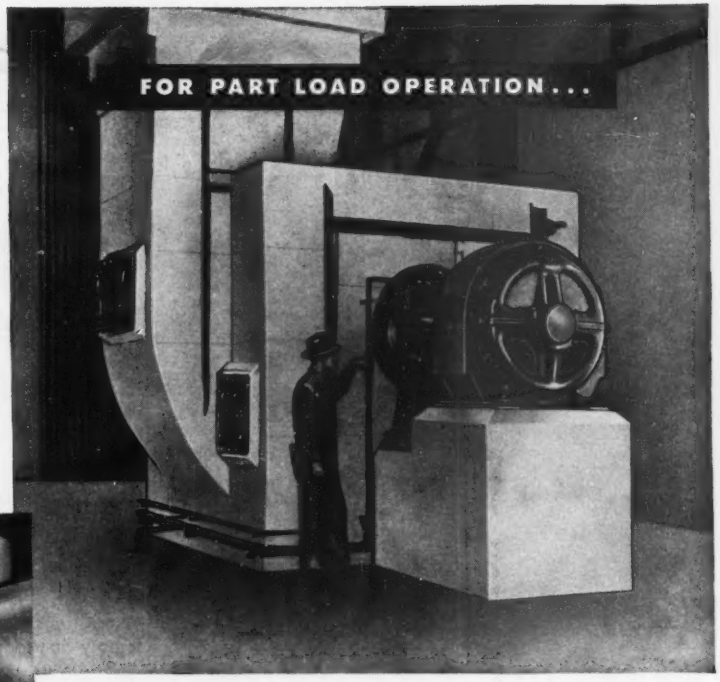
Next time you order wire, cable or molded parts, remember to specify Fiberglas Insulating Materials. It's the cheapest "life insurance" you can buy for your products.

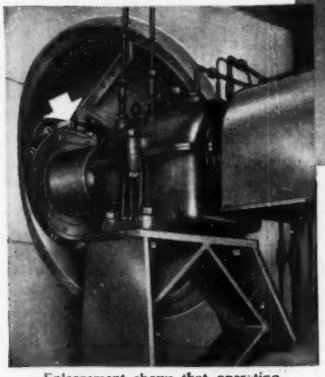
Owens-Corning Fiberglas Corporation, Electrical Sales Division, Dept. 858, 16 East 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS *is in your life..for good!*

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

207 COMPANIES 686 FANS





Enlargement shows that operating mechanism of the new Sturtevant Vane Control is outside the gas stream. It is free from build-up of fly ash and is readily accessible for inspection.

Write today for DB 92-810 describing Vane Control.

207 COMPANIES ARE NOW USING NEW STURTEVANT VANE CONTROL® FOR 686 MECHANICAL DRAFT FANS

HERE'S WHY—Adjustable Inlet Vane Control is the most efficient and economical means of controlling fan output over a wide percentage of capacity. Regulation to exact pressure and volume requirements is instantaneous and permits great power savings when the system is not operating at full rated capacity. A few of these 207 companies are listed below:

CENTRAL STATIONS	INDUSTRIAL PLANTS
Alabama Power Company	Aluminum Company of America
American Gas & Electric System	American Tobacco Company
Cleveland Electric Illuminating Co.	Caterpillar Tractor Company
Consolidated Edison Company	The Coca-Cola Company
Metropolitan Edison Company	Diamond Alkali Company
New Jersey Power & Light Company	Esso Standard Oil Company
New York State Electric & Gas Corp.	Lever Brothers Company
Pacific Gas & Electric Company	Pratt & Whitney Aircraft
Pennsylvania Electric Company	Revere Copper & Brass Incorporated
Philadelphia Electric Company	United States Rubber Company

Full information on power savings through the use of Vane Control with forced or induced draft fans, industrial fans and centrifugal compressors is given in DB 92-810. For a free copy, write Westinghouse Electric Corp., Sturtevant Division, 162 Damon Street, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE...IF IT'S **Westinghouse**

PUTTING *Air* TO WORK

J-80236

Out of the red.....almost

Strike settled at long last — materials stock piled for uninterrupted production—orders pouring in with every mail. Blow that whistle — pull that switch — everything all set for full speed ahead. Then . . . the conveyor belt grinds to a stop — just like that, so does work. What had been a scene of bustling activity changes to a rest period. Profits geared to machine regularity, slow to a loss. The repair crew will find a motor breakdown due to failure of insulation on the coil leads. In order to save pennies, a motor manufacturer lost dollars in good will.

The right electrical insulation is the best insurance for your product — and your reputation. This is the reason more and more electrical equipment manufacturers are turning to BH "649" Fiberglas Sleeving and Tubing.

Available in three grades — A-1, B-1, and C-1, BH "649" is a tough, superior insulation remarkably abrasion resistant and permanently flexible. It will take unusual abuse without loss of its physical properties, or dielectric strength. In fact, often a less expensive grade can be used since there is little or no loss of dielectric strength in assembly or product use.

BH "649" is unaffected in heat tests of 425-450°F for 15 minutes, 302°F for 24 hours, 220-230°F for 1500 hours. Can be doubled back upon itself without cracking at −49°F.

Crackproof, splitproof, peelproof, frayproof, it will not fog, corrode or support combustion, resists moisture, oil and ordinary chemicals.

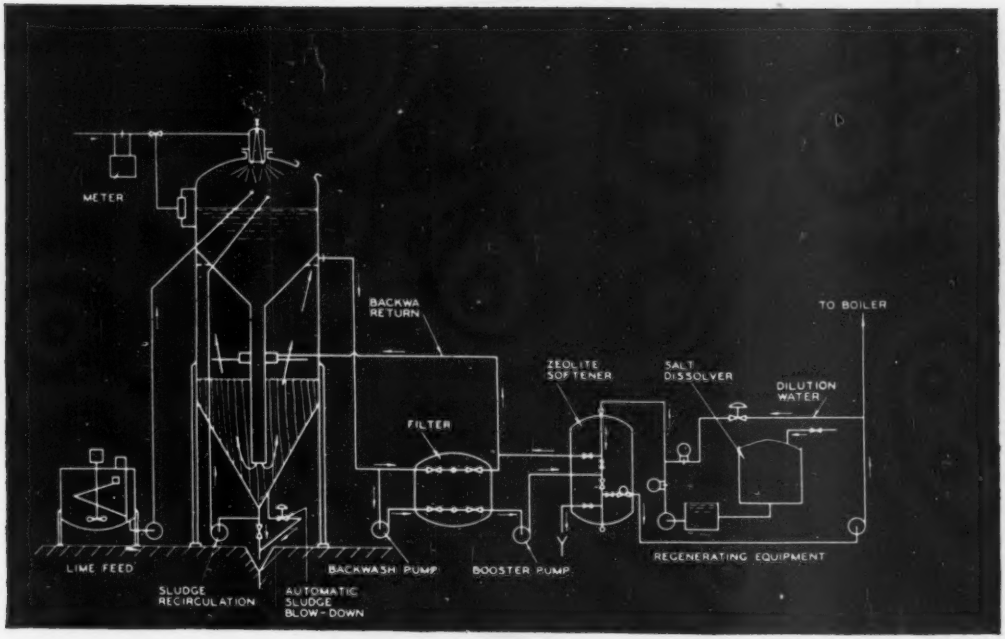
BH "649" is one of a family of electrical insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements — product, temperatures, voltages — we will gladly furnish samples for testing purposes.

Address Dept. W-11

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.



COCHRANE HOT PROCESS ZEOLITE SOFTENER

1. saves chemicals
The zeolite softener uses salt instead of the more expensive soda ash and phosphates, bringing down the cost of chemicals considerably.

2. saves on capital investment The cost of adding zeolite equipment to a hot process installation is far less than the addition of an independent sedimentation tank and chemical feed for a two-stage phosphate process.

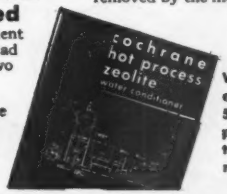
3. lower CO_2 in steam
The lower alkalinity resulting from using lime alone, plus the fact that this alkalinity is all carbonate, causes a reduction in CO_2 generated in the steam.

4. less operating attention The use of the zeolite softener with its simplicity of operation is an advantage which is enhanced by the longer periods between regenerations, due to the lower hardness of the hot process softener effluent.

5. less floor space and head room required
The addition of the zeolite equipment requires less floor space and less head room than that required for two stage phosphate equipment.

6. lower alkalinity The use of lime (or Dolomitic lime) as the sole reagent in the hot process means that the alkalinity can be reduced to about half that obtained with lime and soda ash.

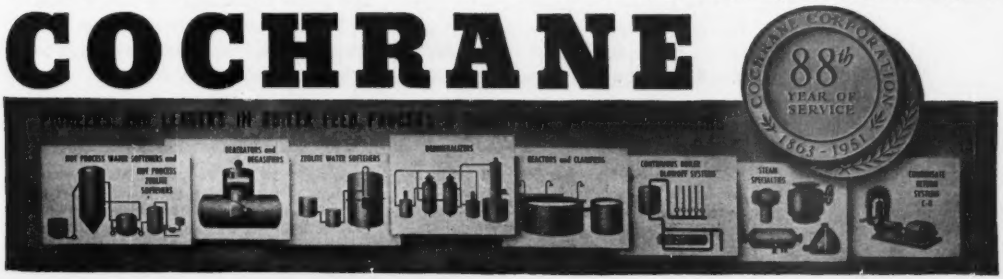
7. only one chemical needed in the hot process It is generally possible to use a single reagent in the hot process, namely lime or Dolomitic lime, precipitating the bicarbonates and magnesium, leaving the remaining hardness to be removed by the more economical zeolite.



Write for a copy of Publication 5001, giving complete details on this new and economical process

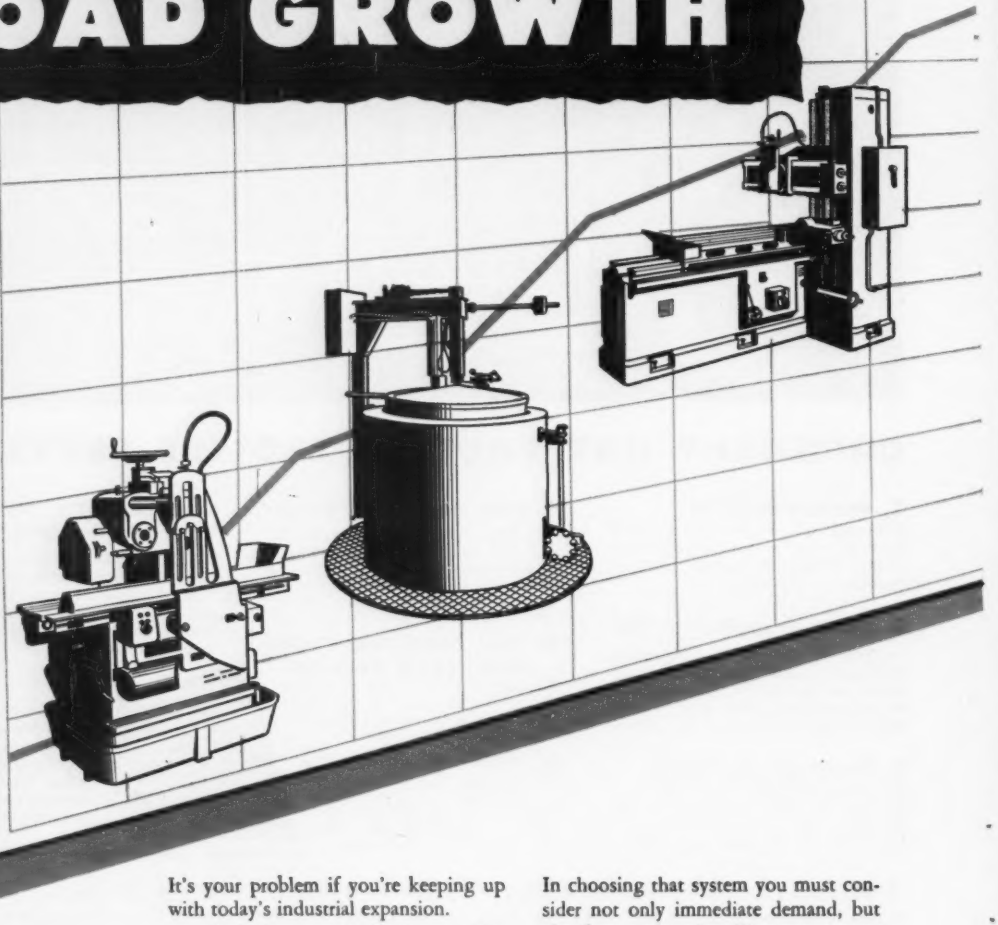
COCHRANE CORPORATION • 3146 N. 17th St. • Philadelphia 32, Pa.
In Canada: Canadian General Electric Co., Ltd., Toronto • In Mexico: Babcock & Wilcox de Mexico, S. A., Mexico City • In Europe: Recuperation Thermique & Epuration, Paris

COCHRANE



PROBLEM:

LOAD GROWTH

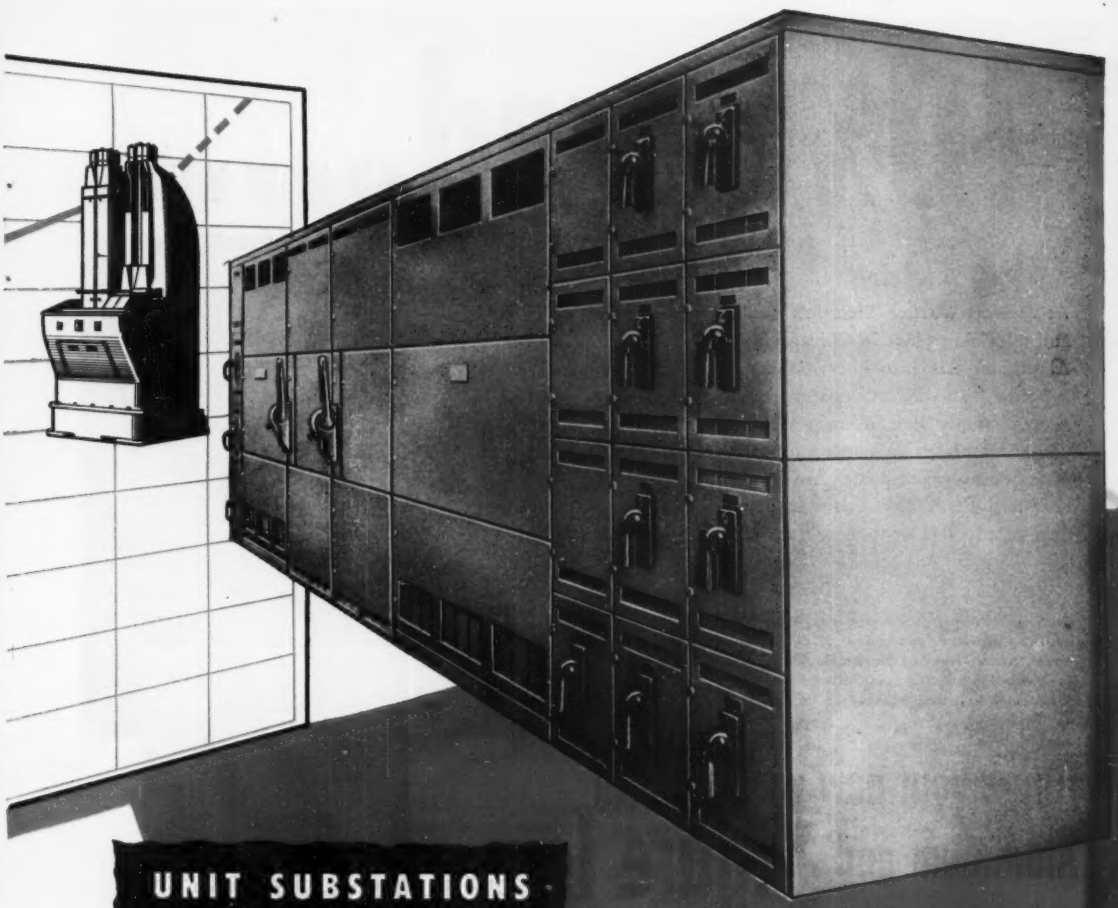


It's your problem if you're keeping up with today's industrial expansion.

And when new production machinery adds load upon load to your electrical system, your planning naturally includes installation of a unit substation system. In choosing that system you must consider not only immediate demand, but also future expansion. The system must be designed and engineered to meet your specific requirements, flexible enough to be expanded for future needs.

THE ANSWER: I-T-E UNIT SUBSTATIONS!

I-T-E Catalog 9000 describes all types of secondary unit substation equipment, offers concise, easy-to-use information on selection of distribution systems and equipment. One page alone, on cost comparison of basic power distribution systems, may save you weeks of investigation and reduce initial investment. Send for Catalog 9000. I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa. Subsidiaries: Railway and Industrial Engineering Co., Greensburg, Pa.; Eastern Power Devices, Ltd., Toronto.



UNIT SUBSTATIONS

Here is a typical I-T-E indoor unit substation with air cooled transformers. Substation arrangement puts primary load break interrupter switches and transformers in the center. As load grows, addition of low voltage switchgear to either end is simple and inexpensive.

Uniform appearance of the structure and symmetry of enclosing panels are consistent with the operating excellence of I-T-E switchgear.

The I-T-E Company

40% Saved on new wiring

At Stewart-Warner Electric's radio and television plant in Chicago, 4/0 Aluminum RH insulated conductor supplies 440-volt AC power for a new assembly line. Savings due to using Aluminum amounted to over 40% because of the cable's low initial cost and the easier, faster installation of the lighter-in-weight metal.

Electricians Howard Norton (left) and Al Iverson soldering aluminum connections at distribution panel. *Below:* Howard Norton, looking over completed job at panel said, "Aluminum is very satisfactory to install because of its lightness and workability . . ."

figure your new wiring job in Aluminum and figure low

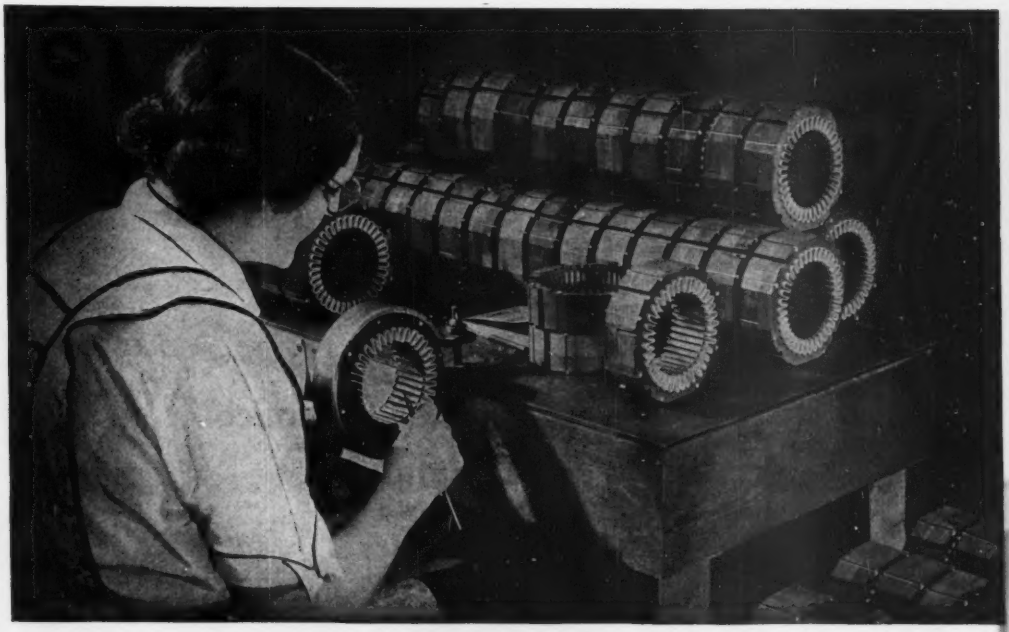
Get prices both ways—in Alcoa Aluminum and in copper. See for yourself the worth-while savings possible when you plan wiring for production lines, new power feeders or improved wiring for higher capacities.

Although the rearmament program restricts the use of Aluminum we are ready to help you with the planning for trouble-free, low-cost wiring. For information write ALUMINUM COMPANY OF AMERICA, 1776L Gulf Bldg., Pittsburgh 19, Penna.

Aluminum Conductors

ALCOA

of ALCOA EC ALUMINUM are made by leading manufacturers



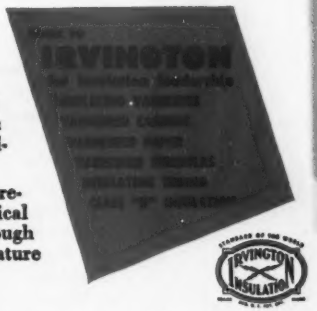
"Motors with IRV-O-SLOT insulation give year after year of service"

The Kingston-Conley Division of the Hoover Company uses Irvington IRV-O-SLOT insulation on its famous line of electric motors. Mr. A. E. Ott, Sales Engineer at Hoover, tells *why*:

"The high quality of the paper backing used in IRV-O-SLOT insulation has been fully proved by the many years over which our motors give satisfactory service. We find, too, that Irvington's slitting facilities give us greater flexibility in selecting paper widths, and allow us to shorten up our scheduling cycles."

These are among the reasons why IRV-O-SLOT has been the choice of many an electrical manufacturer, ever since Irvington introduced it as one of the *first* combined varnished-cambric-and-backing slot insulations.

The IRV-O-SLOT line now includes insulation for every slot requirement. Backing papers combine high dielectric and mechanical strength with ease of forming. Bonding adhesive allows enough "give" to prevent rupture of varnish film. IRV-O-SLOT literature is yours for the asking—just use the coupon below.



Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

Plants: El Monte, California Hamilton, Ontario, Canada

EWO-11-5-51

Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N. J.
Gentlemen:
Please send me technical literature on IRV-O-SLOT insulation.

Name.....
Company.....
Address.....
City..... **State**.....

44% MARGIN OF SAFETY

...with the Kidde Dry Chemical Extinguisher

Kidde Dry Chemical Extinguishers shield the operator from the flames with a heat-absorbent curtain of fine powder. The Kidde 20 pounder covers 36 square feet—44% MORE AREA than required by Factory Mutual Laboratories. The Kidde 30 pounder covers 48 square feet—as compared to the 35 square feet required by Factory Mutuals.

These Kidde extinguishers drive the dry chemical with enough force to overcome updrafts caused by the heat of the fire. The special Diffuser Horn applies the powder in a cloud-like pattern—helping to eliminate the splash of flammable liquids and offering the greatest protection to the operator.

For fires in textiles, flammable liquids and live electrical equipment Kidde Dry Chemical Extinguishers are highly effective. Write for information on portable or wheeled units.

Kidde

The word "Kidde" and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc., 1130 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

NEW WESTINGHOUSE FLUORESCENT MERCURY LAMP

GIVES

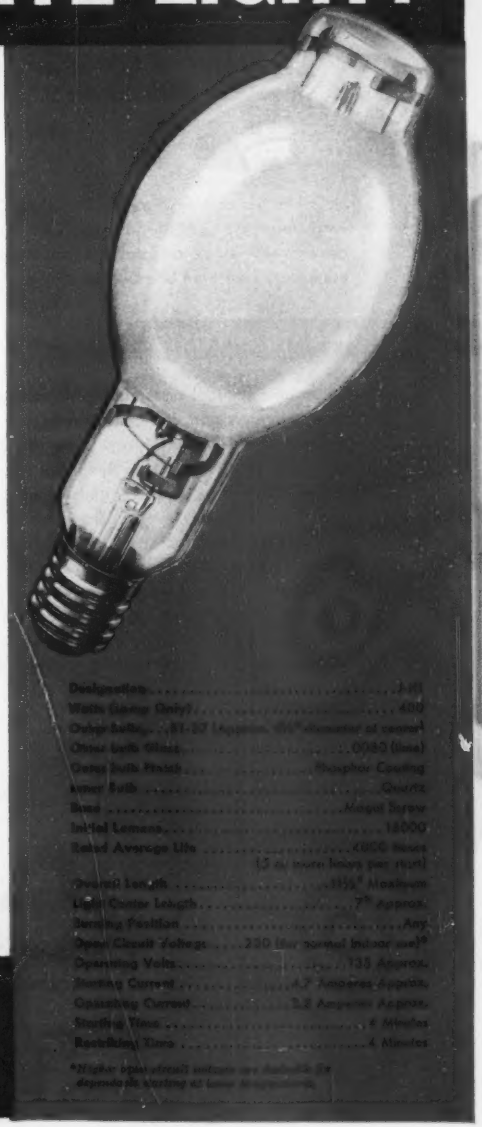
GOLDEN-WHITE LIGHT!

Exclusive New Westinghouse Lamp Produces More Light of a Warmer Color Than Conventional Mercury Lamps

Here's a basic new light source—a mercury type lamp which produces a *golden-white light*—the new Westinghouse 400 watt J-H1 Fluorescent Mercury Lamp.

This outstanding new improvement is accomplished by the isothermal-shaped bulb which permits a special phosphor coating to fluoresce red at maximum efficiency. The red light balances the spectrum to provide a golden-white light. This new light source combines all the advantages of high output, high efficiency and long life, plus 20% more light than the 400-watt A-H1 lamp. In addition, higher color quality eliminates the need for color-correcting incandescent lamps. Ideal for industrial and large area outdoor lighting, the J-H1 Fluorescent Mercury Lamp can be used in the same sockets as the A-H1 or the E-H1 types without additional equipment.

For more information about the practical applications of this lamp, write the Lamp Division, Westinghouse Electric Corporation, Bloomfield, New Jersey.



YOU CAN BE SURE... IF IT'S

Westinghouse

HOLAN BODIES

Help Solve Budget Problems *With* LOW INITIAL COST LOWER OPERATING COSTS

Records show that Holan Bodies are helping Utility Companies reduce costs in their line construction and maintenance work.

LOW INITIAL COST

Holan Bodies cost no more than ordinary line bodies, yet they incorporate many exclusive and extra features. Curbside loading, flush type door handles, concealed hinges, sliding material drawers with stops, adjustable compartment partitions and self-sealing doors are all standard equipment on Holan Line Bodies with no extra charge for these features.

LOWER OPERATING COSTS

Holan efficient tool and material layout helps your crew operate more effectively. Hot sticks, ropes, climbers and derricks are available from the ground without climbing in and out of the body. New style material trays eliminate losing or mixing of small parts.

Other Holan features help lengthen the life of the chassis. Excessive side compartment loading space has been eliminated to minimize overloading. Use of high tensile steel increases strength and reduces weight. Choice of nine models assures the correct body length to give better load distribution.

All these factors, the result of sound engineering design, improve crew efficiency . . . minimize overloading . . . and lower the cost per mile of operation.

Model CL-112

Model CM-138

Compare for Quality and Engineered Features

J. H. HOLAN CORPORATION

BODIES and ACCESSORIES for UTILITIES

4100 West 150th Street Cleveland 11, Ohio

DISTRICT SALES REPRESENTATIVES

2754 N. 92nd Street, Milwaukee 10, Wis.

6-03 161st Street, Beechhurst, Queens, N. Y.

DISTRIBUTORS

Baker Equipment Engineering Co., Summit and Norfolk Streets, Richmond, Virginia

2401 Hutchinson Avenue, Charlotte, N. C.

A. & A. Supply Company, P. O. Box 769, Abilene, Texas

P. O. Box 1516, Albuquerque, N. M.

Schetky Equipment Corp., 1810 S. E. 10th Avenue, Portland 14, Oregon

Specify ACCURATE TAPES

—for every wiring need!

ACCURATE FRICTION TAPE

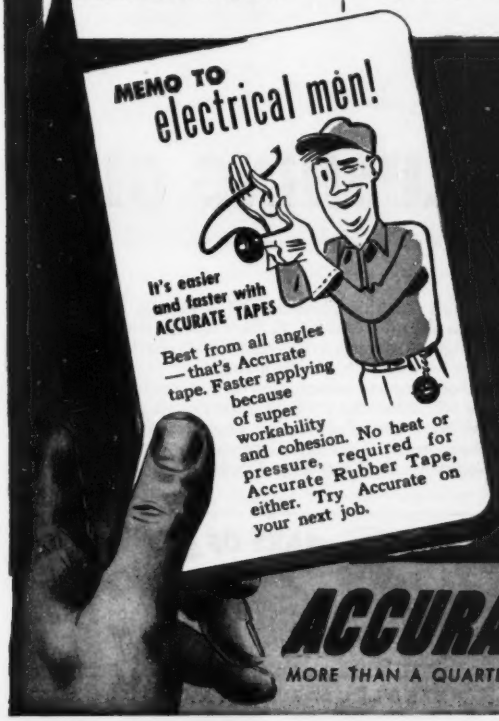
Features the best of material carefully fabricated to provide maximum mechanical protection. Available in Standard and A.S.T.M. grades.

ACCURATE RUBBER TAPE

Offers high elasticity, high dielectric strength and super aging qualities. Made in both Standard grade and A.S.T.M. — A.A.R. Specification

ACCURATE PLASTIC TAPE

Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.

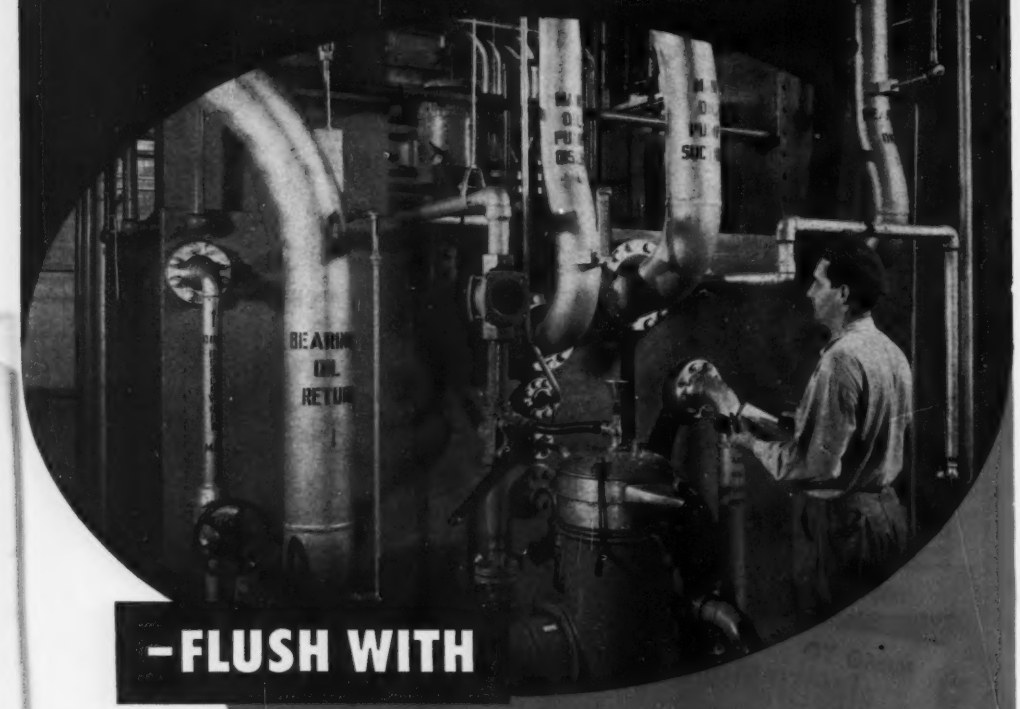

MEMO TO
electrical men!
It's easier and faster with ACCURATE TAPES
Best from all angles —that's Accurate tape. Faster applying because of super workability and cohesion. No heat or pressure, required for Accurate Rubber Tape, either. Try Accurate on your next job.

for the electrical industry are manufactured to precision standards by men who have devoted a lifetime to producing tapes of superior quality. Every foot is carefully made and constantly inspected to assure uniform high quality. The sure way to complete tape satisfaction is to specify ACCURATE by name — every time. Get all the facts on ACCURATE Tape now! Just call or write the Accurate Manufacturing Company, Garfield, New Jersey, for new illustrated literature which includes complete specifications and technical data covering the entire ACCURATE line of quality tapes. There is no obligation.

ACCURATE your best buy in tape

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

Make sure your new turbine has a clean lubricating system



—FLUSH WITH GULF TURBINE FLUSHING OIL

The surest way to clean the lubricating system of your new turbine thoroughly is to flush with Gulf Turbine Flushing Oil. It has excellent flushing action on welding scale, chips, sand, and other loose foreign matter. It is also very effective in removing grease-type slushing compounds, which may have a harmful effect on the lubricating oil. And you make sure that inaccessible parts of the system are clean.

Because Gulf Turbine Flushing Oil has been fortified to provide an effective rust preventive film, all oil bathed surfaces in the system get complete protection against rust during the time between flushing and initial filling.

An important advantage of Gulf Turbine Flushing Oil over other types, such as certain solvents, is that the undrained portion in the turbine systems does not impair the lubricating value of the turbine oil. For Gulf Turbine Flushing Oil is itself a satisfactory lubricant.

Only one-third to one-half of a normal turbine oil fill is required for thorough flushing. Thus the expense of flushing your new turbine with low-cost Gulf Turbine Flushing Oil is nominal.

Gulf Turbine Flushing Oil is equally effective for units already in service. In these it helps remove harmful sludge and organic acids—helps flush out deposits which may have collected in the system.

For complete information on this quality product and for recommended procedure for cleaning your turbine, call in a Gulf Lubrication Engineer. Write, wire, or phone today. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

ElectroniK RECORDER now combined with ADVANCED TELEMETERING SYSTEM

General Electric frequency-type telemetering system with ***ElectroniK*** *strip-chart recorder.*

THE increasing need for rapid and continuous transmission of such measurements as total power generated or interchanged and other pertinent information has led to the development of telemetering equipment such as that shown above. An *ElectroniK* recorder assures rapid and accurate collection of all vital information at a central location . . . for easy evaluation and totalization.

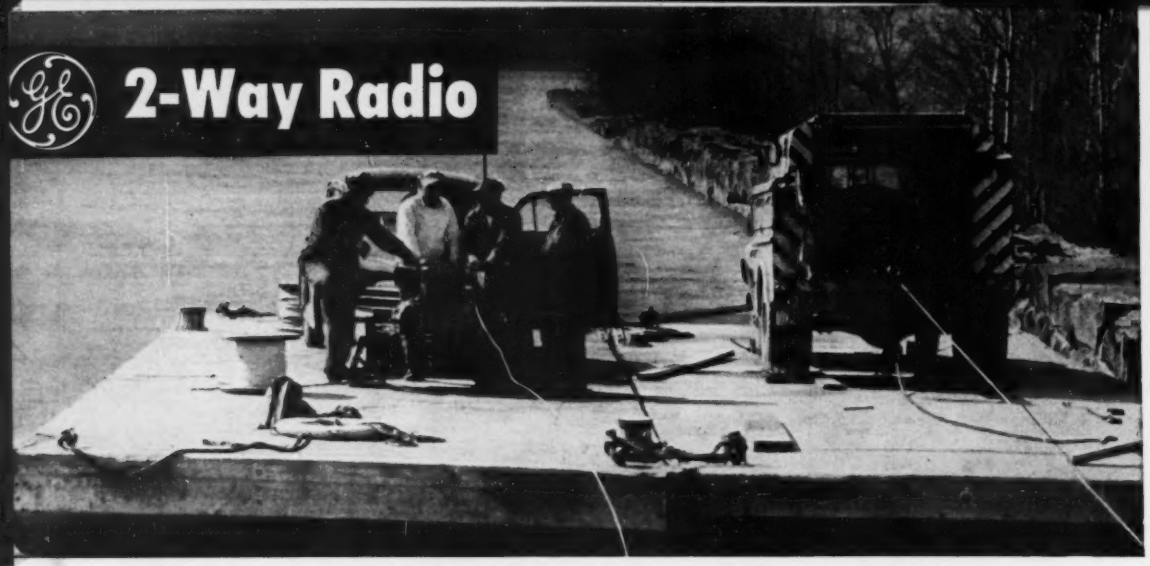
The telemetering system comprises an arrangement capable of measuring, transmitting, receiving and recording any measurable variable that can be converted into an electrical quantity. It keeps the load dispatcher in constant touch with each station . . . helps him determine when to pick up or drop blocks of power, how well the outlying stations are maintaining their loads, and to keep up to date on the relation of his area to adjacent areas.

Measurements at distant points must be accurately transmitted and recorded in the shortest possible time. The *ElectroniK* recorder is combined with an *advanced telemetering system* to accomplish the job. For detailed information, write for a copy of Data Sheet No. 9.1-10.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
Brown Instruments

2-Way Radio



Stringing conductor for 114,000 volt line from a barge in the Susquehanna River. Truck pulls wire from center of river because electrified railroad tracks on both banks prevent proper start from ground. General Electric 2-way radio in car on barge facilitates river-to-shore communication, greatly reduces danger to personnel.

Remote station transmitter is used by the foreman who makes his radio report from a distance of 40 miles. Compact, shelf-mounted unit has a power output of 50 watts.

Lineman's confidence is increased when voice contact with dispatcher is as near as the mike on the dashboard. Reports and instructions are exchanged instantly by General Electric 2-way radio.

At METROPOLITAN EDISON COMPANY

FASTER COMMUNICATION MEANS BETTER SERVICE!

Pennsylvania Utility Uses General Electric Mobile Radio for All-Year Dependability

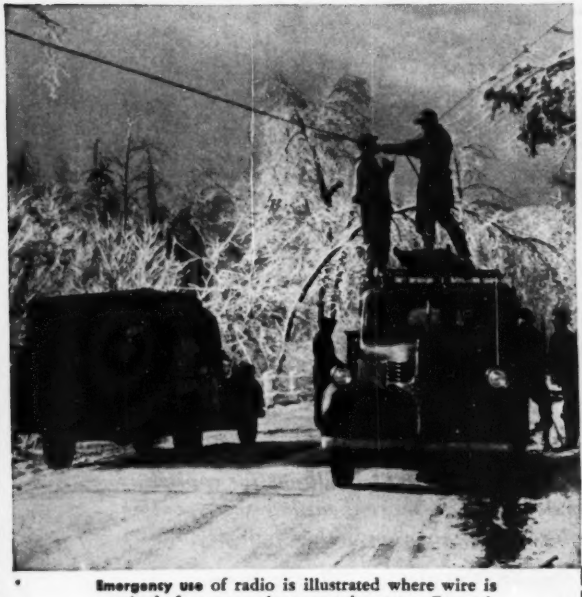
LIKE all companies that sell service, electric utilities fight a common enemy—time. To reduce the time lag between outage and restoration, to give better service to the customer, is a constant, year 'round problem.

General Electric has the answer. It is *mobile radio*—2-way voice communication *instantly*—from car to car in motion, or between fixed and moving points. G. E.'s FM radio beam needs no wires, rides above static, brings in voices clearly and evenly in any weather.

It is a matter of record that G-E radio systems are cutting costs for utilities every day. Metropolitan Edison of Pennsylvania is one enthusiastic customer. You'll find others in all sections of the United States and Canada.

G. E. will survey and engineer to fit your terrain and your individual needs. If you're looking for better, faster methods of communication, get in touch with us. *General Electric Company, Electronics Park, Syracuse, New York.*

Faster dispatching by radio routes service vehicles to jobs with minimum delay, increases overall efficiency. Utilities everywhere have used General Electric radio for years, consider it an indispensable tool in all mobile operations. Frequently, the time and money saved in one emergency pays for the entire radio system.



Emergency use of radio is illustrated where wire is repaired after severe sleet storm in eastern Pennsylvania. G-E radio in truck, right, was only communication between workmen and dispatching office.

Immediate action in any weather is an important feature of G-E radio equipment. Delay is costly to utilities, can be minimized by 2-way system.

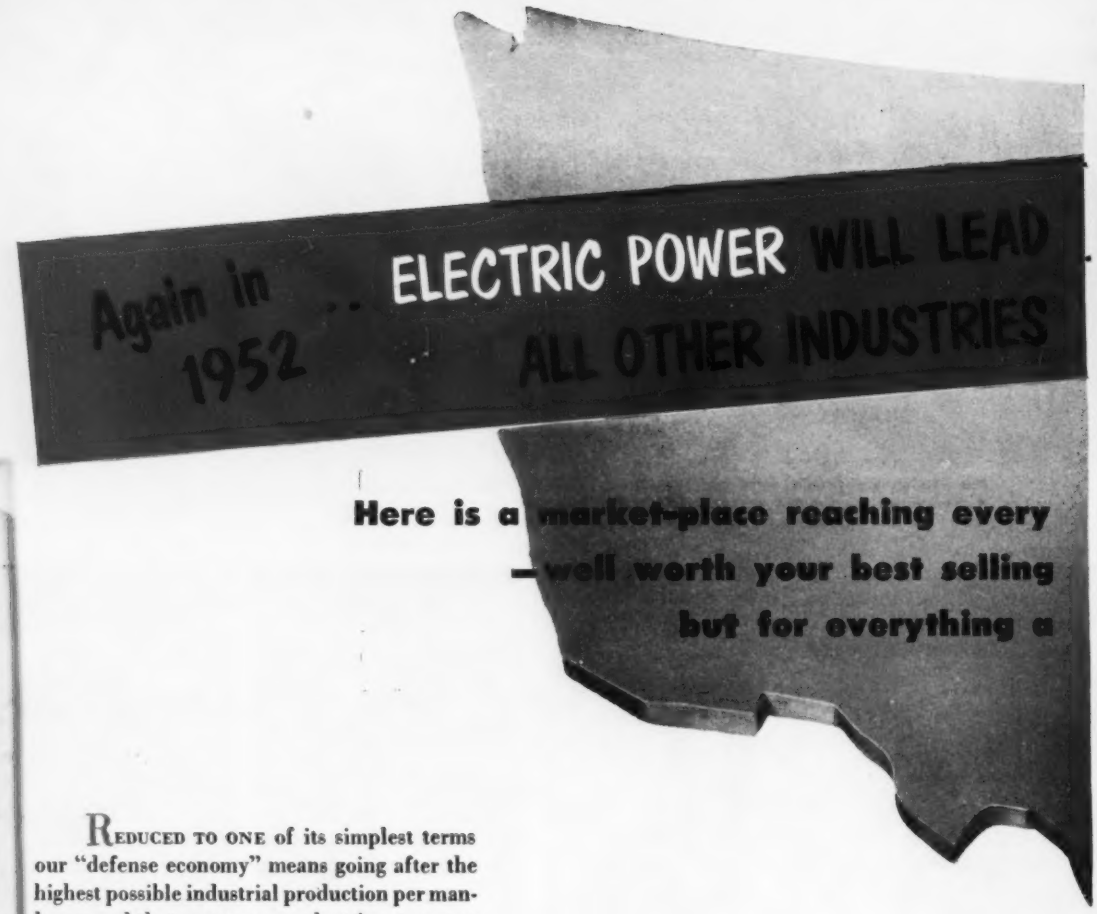
District Operating Superintendent Clyde Lenhart keeps in touch with river crossing operation via car radio from east bank of Susquehanna.

FOR CIVIL DEFENSE, *too, your radio system can contribute to public safety. Your G-E communications man will explain how. Ask him about it.*

FREE—Complete information on G-E 2-way radio systems and how they operate to your advantage. We will send you literature on request. Write: *General Electric Co., Section 19111-5, Electronics Park, Syracuse, N. Y.*

You can put your confidence in—

GENERAL ELECTRIC


Again in 1952 .. ELECTRIC POWER WILL LEAD
ALL OTHER INDUSTRIES
Here is a market-place reaching every
—well worth your best selling
but for everything a

REDUCED TO ONE of its simplest terms our "defense economy" means going after the highest possible industrial production per man-hour; and that means more electric power per industrial worker.

In 1950, American industry used 139 billion kilowatt hours of electricity. In 1953, it will use over 200 billion.

Five years from now, if we continue in our present economy, we'll have something like five million more homes, and every home, on the average, will use 630 *more* kilowatt hours of electricity than it did last year.

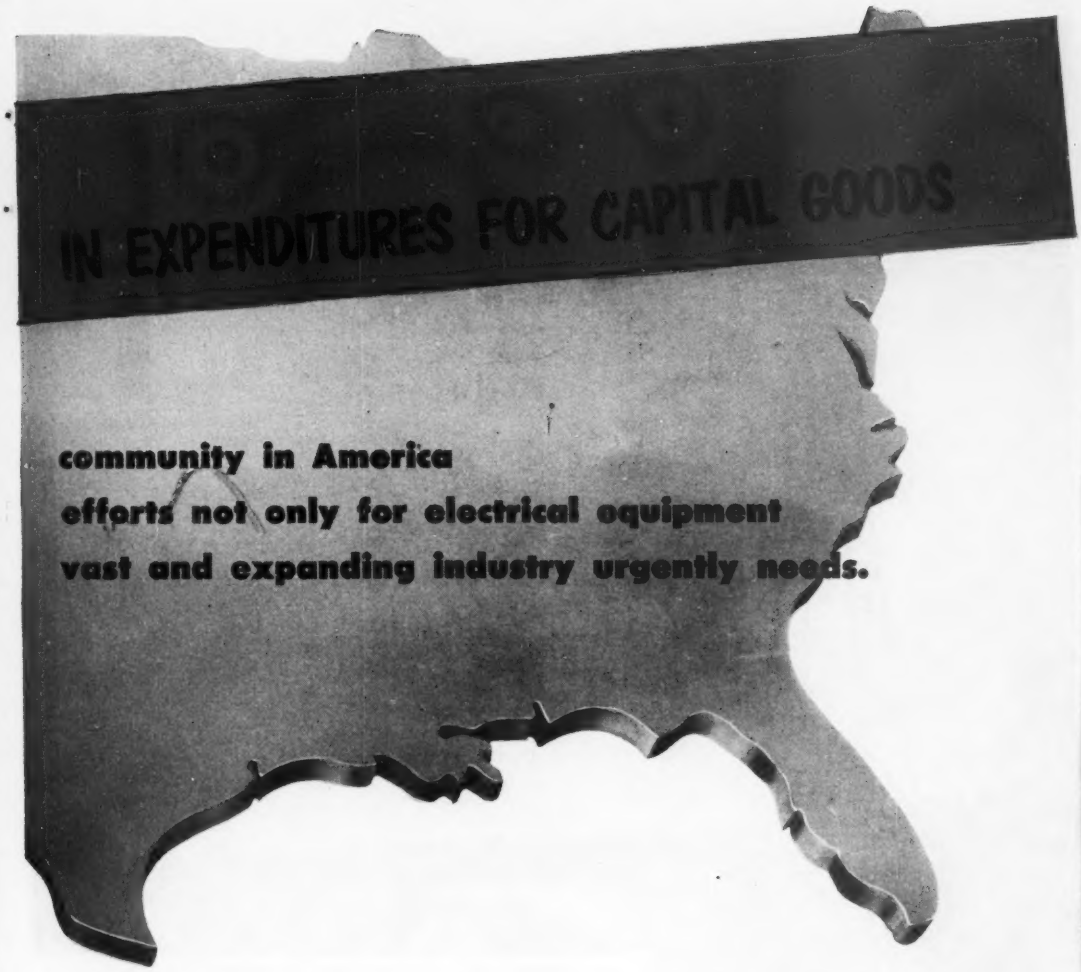
To meet this ever-increasing demand the utilities must build new capacity for generating electric power . . . more system to transmit it, distribute and use it.

And so, despite cut-backs due to allocations of copper, aluminum and steel, the electric utilities (public and private) will spend a whopping $3.4 billions for capital goods in 1952—more than they ever spent before. More than any other industry.

Building this plant . . . all over America . . . will require industrial goods in vast quantities, of every kind, from office machines to bricks and bulldozers.

Here indeed is a vast and dynamic market worth your most careful sales planning.

We would be glad to show you the figures that make up its exciting dimensions, and how you can reach it; influence and sell it, the quickest and most economical way.


IN EXPENDITURES FOR CAPITAL GOODS
community in America
efforts not only for electrical equipment
vast and expanding industry urgently needs.

GOOD ADVERTISING PAYS IN

Electrical World

JOURNAL OF THE GREAT GROWTH INDUSTRY FOR 77 YEARS

A McGRAW-HILL MAGAZINE
McGRAW-HILL BUILDING, NEW YORK 18

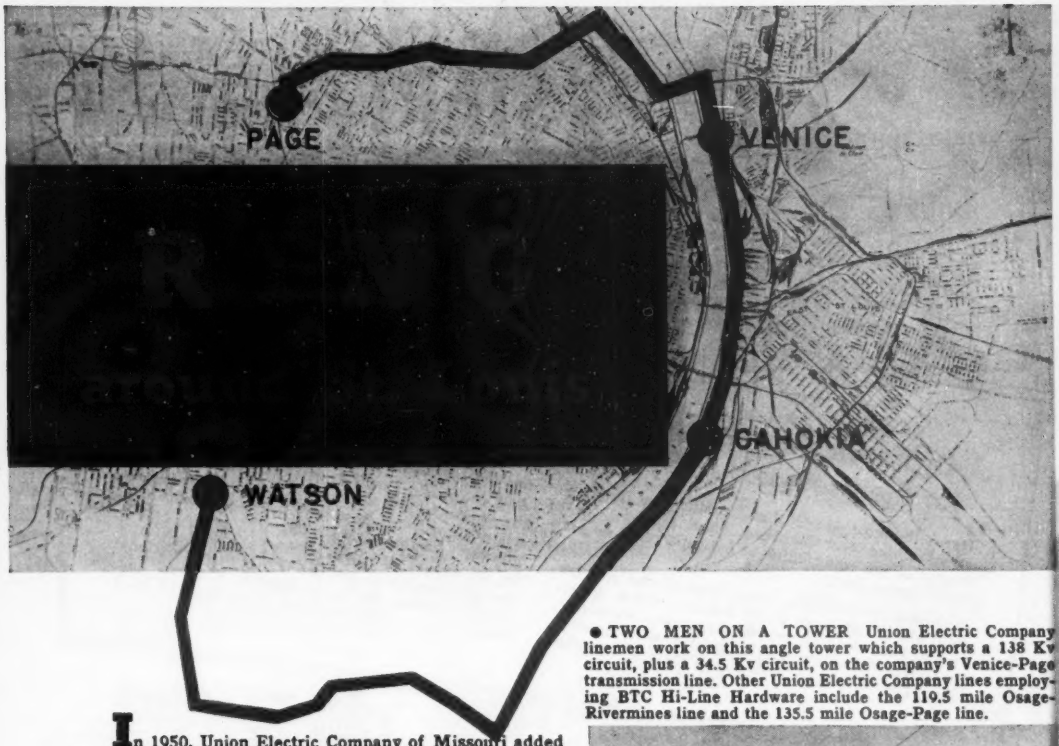
ABC • ABP

● MISSISSIPPI CROSSING High above the banks of the Mississippi, two mighty steel towers support this 2,922 ft. long high-tension span as it crosses the nation's most famous river. The span is part of Union Electric Company of Missouri's 138 Kv St. Louis transmission ring.

Drop Forged BTC Hi-Line Hardware

The BREWER-TITCHENER Corporation

Cortland · New York

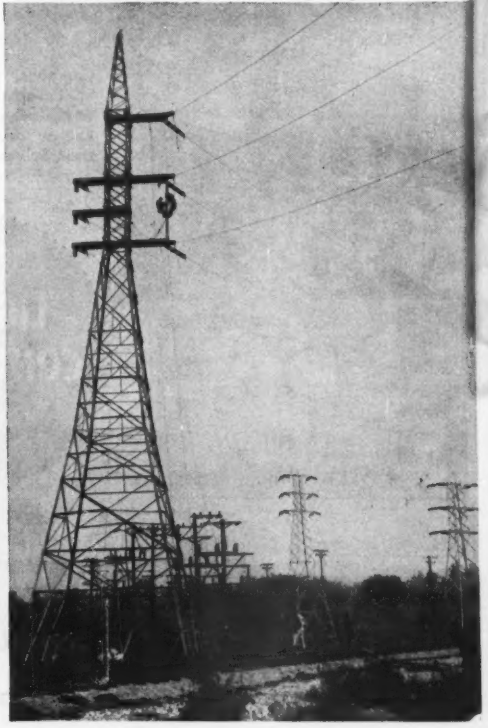


In 1950, Union Electric Company of Missouri added four new lines to its 138 Kv transmission ring around the city of St. Louis. Totaling some 46 circuit miles, these lines each have a 125,000 kva capacity . . . serve as a system tie line around the mid-west metropolis.

Union Electric Company . . . like so many of America's major power concerns . . . has used BTC Hi-Line Hardware for these links in its vital transmission ring. Insist on BTC Drop Forged Clamps and Fittings from your insulator manufacturer . . . you'll find that they're easier to install, give efficient trouble-free performance and help keep maintenance to a minimum.

Sold through your insulator manufacturer only.

● TWO MEN ON A TOWER Union Electric Company linemen work on this angle tower which supports a 138 Kv circuit, plus a 34.5 Kv circuit, on the company's Venice-Page transmission line. Other Union Electric Company lines employing BTC Hi-Line Hardware include the 119.5 mile Osage-Rivermines line and the 135.5 mile Osage-Page line.



START Now with SYLVANIA and stay 'way ahead!

Dramatic, Money-back Campaign lets customers prove for themselves that Sylvania Fluorescent Tubes are better

Here's the most powerful and challenging lighting ad campaign ever launched. Users must be convinced of the better value of Sylvania tubes or get their money back.

Business executives in every part of the country will see this offer in *Time, Business Week, Newsweek, and other important magazines.* Meantime, powerful full-color ads in the *Saturday Evening Post, This Week* and *American Weekly* will emphasize the unbeatable quality of all Sylvania products. And, coordinated with all the above, Bud Collyer on the nation-wide TV show "Beat the Clock," will tell millions more just why Sylvania Fluorescent tubes stay brighter, last longer.

So, don't delay! Write today for full details on how you can partake *in* and profit *by* this big national effort. Address: Sylvania Electric Products Inc., Dept. L-7111, 1740 Broadway, New York 19, N. Y.

Complete, personalized direct mail campaigns are also offered to all Lighting Contractors who feature this nationally advertised Sylvania emblem.

QUALIFIED
LIGHTING CONTRACTOR
SYLVANIA SALES SERVICE

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC. 1901–1951 FIVE DECADES OF PROGRESS 50th ANNIVERSARY

FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

TRANSFORMER COILS are Insulated with NATVAR Varnished Paper

Multiple Unit Coil winding at Standard Transformer Corporation. This operation requires uniform quality insulating materials. Uniformity of thickness and texture aid in meeting close space factors. Natvar varnished paper is used as interwinding insulation because of its high dielectric strength and flexibility. It conforms to the winding without "puckering," thus permitting a compact coil that will withstand even the severest requirements.

Transformers, reactors and related components manufactured by Standard Transformer Corporation, Chicago, have gained wide acceptance for all electronic applications. Their uniformity and durability in military and civilian applications are the result of sound engineering, careful workmanship and quality materials.

Natvar Varnished rope stock Paper is used as interwinding insulation "because of its high dielectric strength and flexibility."

Natvar Varnished Paper and other Natvar flexible insulations are available from conveniently located wholesalers' stocks or direct from our own.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

Ask for Catalog No. 22

THE NATIONAL VARNISHED PRODUCTS Corporation

Telephone Rahway 7-8800 — Cable Address NATVAR: Rahway, N. J.

321 RANDOLPH AVENUE ★ WOODBRIDGE, NEW JERSEY

Controlled

the next Big step forward in AMERICAN POWER GENERATING PRACTICE

Within three decades the electric utility industry has reduced its average heat rate by 65 per cent – from about 40,000 Btu per kw-hr to about 14,000. And rates approximating 9000 are indicated for the most efficient stations now being designed.

On the steam generating side, this amazing progress is attributable to certain major advances of the period. These include . . .

- pulverized coal firing
- water-cooled furnaces
- preheated combustion air
- integrated boiler unit designs
- higher pressures
- higher temperatures
- improved firing equipment
- reheat
- improved methods and means of control

Combustion Engineering–Superheater, Inc., has been prominently identified with all these advances.

With this background Combustion offers the principle of controlled circulation as the next big step forward in power station practice. It does so with the confidence born of more than 10 years of development and operating experience. That this confidence is shared by leading utility engineers and their consultants is evidenced by the following contracts, placed since mid-1950, for . . .

eighteen C-E Controlled Circulation Boilers to serve an aggregate capacity of 2,500,000 kilowatts.

Company and Main Office	Station	Capacity per unit lb of steam per hr	Design Pressure	Steam Temp. primary-reheat
Cleveland Electric Illuminating Co., Cleveland, Ohio	East Lake	875,000	2030	1000 – 1000
Consumers Power Co., Jackson, Michigan	Weadock	1,050,000	2300	1050 – 1000
Duke Power Company, Charlotte, North Carolina	Buck	900,000	2010	1000 – 1000
Philadelphia Electric Company, Philadelphia, Penna.	Cromby	1,450,000	2075	1000 – 1000
Public Service Electric & Gas Co., Newark, New Jersey	Kearny	1,015,000	2650	1100 – 1050
Southern California Edison Co., Los Angeles, Calif.	Etiwanda	920,000	2100	1000 – 1000
Virginia Electric & Power Co., Richmond, Virginia	Chesterfield	750,000	1670	1000 – 1000
	Gilmerton	750,000	1670	1000 – 1000
Wisconsin Electric Power Co., Milwaukee, Wisconsin	Oak Creek	795,000	2050	1050 – 1000

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS, ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

ADVANTAGES

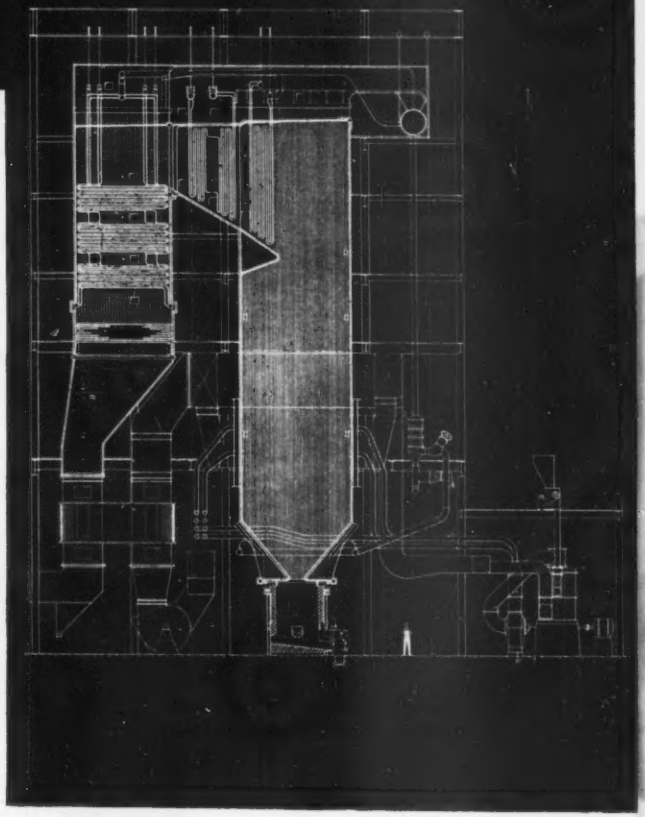
The major characteristics of the C-E Controlled Circulation Boiler are (1) the maintenance of positive, high velocity circulation in all circuits, under all operating conditions, (2) the proper proportioning of water supply to all heating circuits, and (3) the use of small-diameter, thin-wall tubes. These characteristics provide many design and operating advantages, the principal ones being:

DESIGN

- Permits the use of pressures considerably beyond the practical limits of natural circulation boilers
- Introduces new flexibility in proportioning of unit to fit existing space conditions or to reduce height and therefore cost of new plant structures
- Permits the use of bare furnace walls regardless of pressure
- Provides a substantial reduction in weight of pressure parts, and therefore of structural supports

OPERATION

- Maximum availability
- Faster pick-up or drop of load
- Reduced outage time for inspection or maintenance
- Higher plant safety factor



PREDICTION: The decade of the fifties will be marked by the ever increasing recognition of controlled circulation as a major advance in power station practice and by its wide adoption for the higher range of pressures.

B-528

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

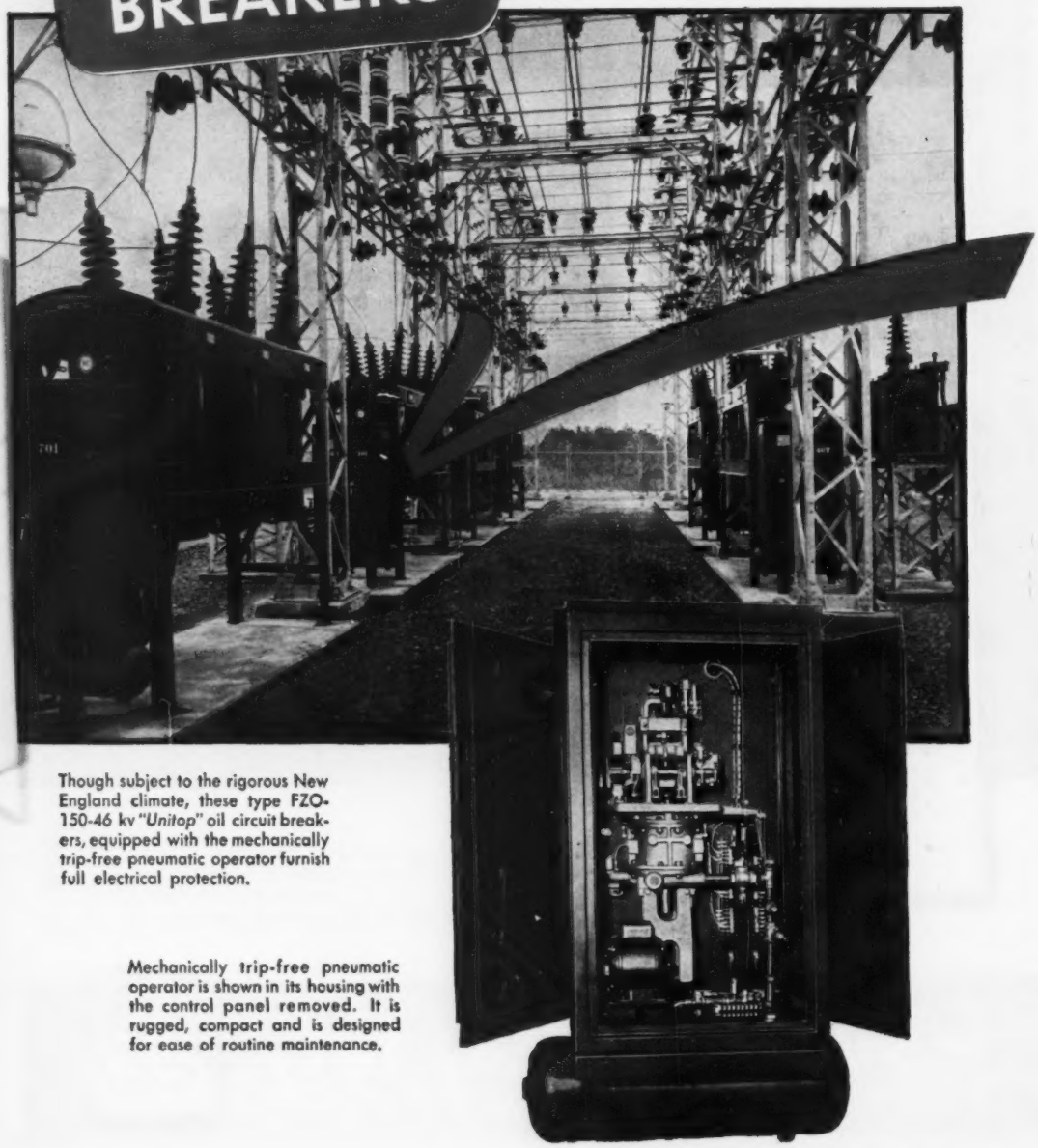
C-E

ALLIS-CHALMERS

Outdoor

OIL CIRCUIT BREAKERS

THE TREND



Though subject to the rigorous New England climate, these type FZO-150-46 kv "*Unitop*" oil circuit breakers, equipped with the mechanically trip-free pneumatic operator furnish full electrical protection.

Mechanically trip-free pneumatic operator is shown in its housing with the control panel removed. It is rugged, compact and is designed for ease of routine maintenance.

IS MORE AND MORE TOWARD

Mechanically Trip-Free Pneumatic Operation

MECHANICALLY trip-free mechanism and pneumatic operation have been combined successfully in Allis-Chalmers outdoor oil circuit breakers to furnish the high speed operation and reliability essential to *full* electric protection.

As the demand grows for circuit breakers of higher interrupting capacities and higher operating speeds, engineers have shown increasing preference for mechanically trip-free pneumatic operation.

Proved Advantages Combined

1. Powerful, instant breaker closing with pneumatic operation. Opening piston is normally in ready-to-close position for fast reclosing. Self-contained compressor and motor with air storage tank stores power for at least five closing operations.

2. Positive breaker tripping with mechanically trip-free mechanism. Contact mechanism is uncoupled from closing force and driven downward to open by powerful accelerating spring, assisted by gravity and free of any drag.

Pneumatic operation and mechanically trip-free mechanism are two individually proved features that date back to the early history of Allis-Chalmers oil circuit breakers. Their successful combination as a unit dates back for more than a decade.

To learn more about the advantages of mechanically trip-free pneumatic operation or breakers in the ratings you need, call your nearby Allis-Chalmers sales office. Or write Allis-Chalmers, Milwaukee 1, Wis.

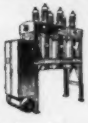
A-3422

A-C ALLIS CHALMERS

ALLIS-CHALMERS

Mechanically Trip-free Pneumatic Operator Is Standard Equipment On These Allis-Chalmers Outdoor Oil Circuit Breakers

Type FZO-150 *Unitop* breaker 14.4 to 46 kv, 8-cycle opening, 20-cycle reclosing*

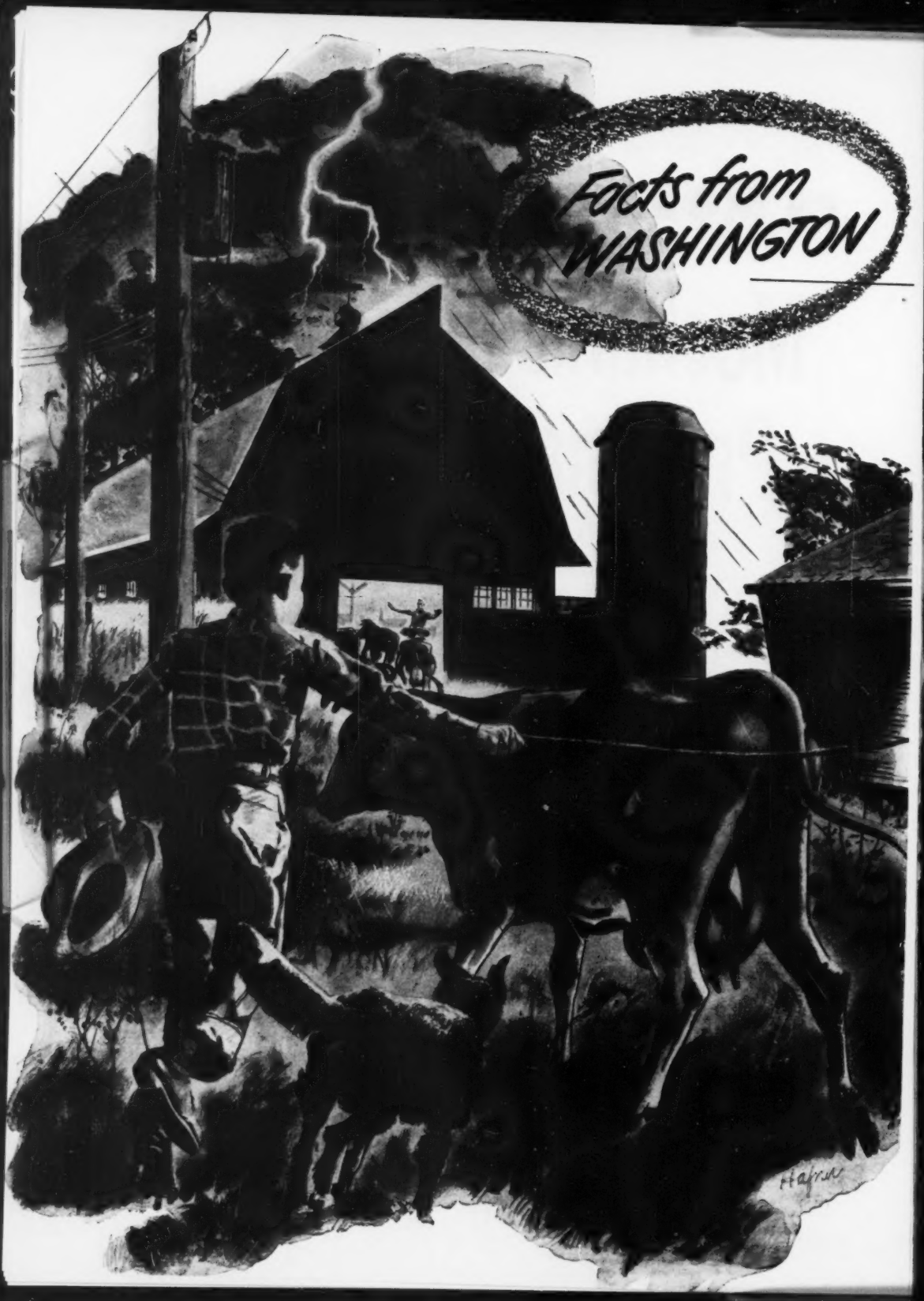


Type FZO-151 . . . 69 kv, 5 or 8-cycle opening, 20-cycle reclosing*

Type BZO-160 . . . 69 kv, 8 cycle opening, 115 to 230 kv — 3 or 5-cycle opening with 20-cycle reclosing*

Unitop is an Allis-Chalmers trademark.

*20-cycle reclosing standard for 600 and 1200 amp breakers


Facts from
WASHINGTON

"Single 'CSP' Transformer saves us $59.20 per year"

"One 'CSP' transformer is saving us an average of eight service calls a year —at a cost of at least $7.40 per trip," reports a utility in Washington State.

"In a rather inaccessible location, we had a conventional distribution transformer at the end of a rural line. Ten years' experience indicated that it cost us an average of $59.20 per year to maintain service at this troublesome spot. In addition, each outage averaged over two hours' duration . . . a cause of considerable customer irritation.

"Three years ago we replaced it with a 'CSP' transformer. Soon afterward a severe electrical storm damaged 18 conventional transformers in the same area, but left the 'CSP' transformer untouched in the location that had been the worst offender. To date this 'CSP' transformer has not had a single 'outage'."

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following: J-70595

NATIONAL AVERAGES

	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

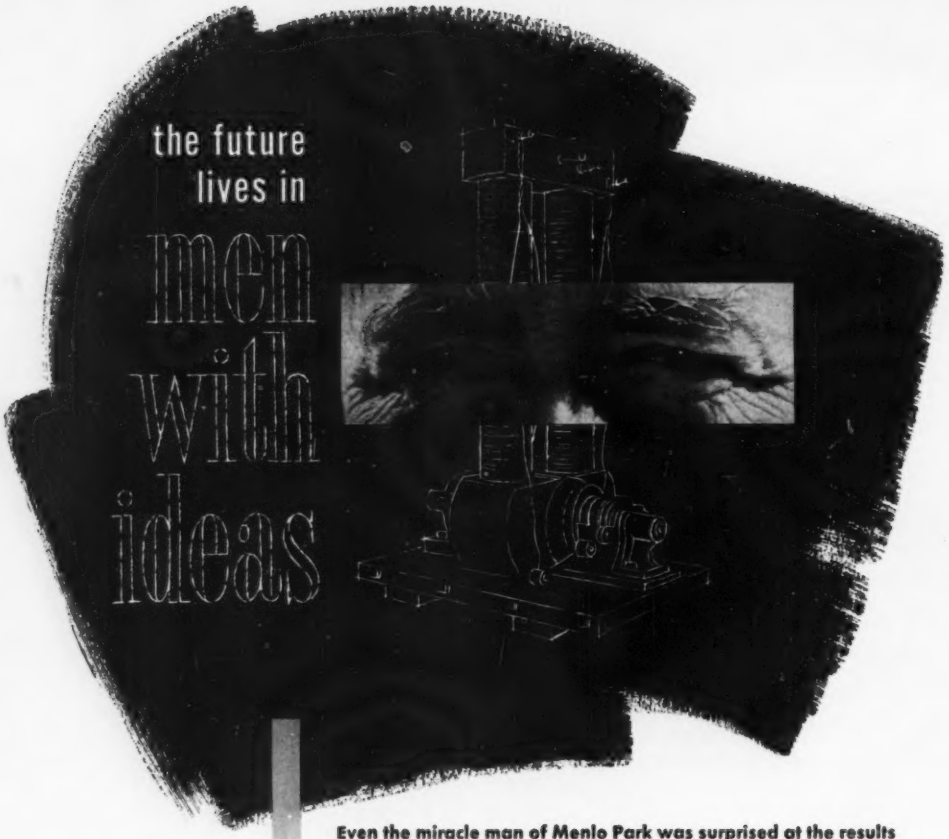
If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4-247-B, "Transformer Costs and Their Relation to Profits", Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices. originated and patented by Westinghouse

YOU CAN BE SURE.. IF IT'S

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS



Even the miracle man of Menlo Park was surprised at the results of his early experimentation with dynamo design. Edison's ungainly "longwaisted Mary Anns", built in 1883 to improve upon existing dynamos having efficiencies of 38% or less, were almost 2½ times as efficient! One of thousands of notable contributions to power generation, this event helped to realize the great IDEA of an electrified America.

KERITE—already well known as an insulating material when the electric power industry began to take form—assumed an early, important, and continuing role in the insulation of aerial, underground, and submarine cable. Its properties, still unrivaled today, are proving themselves in more and more vital circuit applications.

By conscientious workmanship, careful handling, and a continuing search for new applications of its unique formula, The Kerite Company has been able to anticipate the power industry's needs. It will continue to apply itself to the technical world of "ideas" in which now, as in Edison's day, the future of America's power still lives.

The Kerite Company, 30 Church St., New York 7, N. Y.
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Editorials

A New System of Government

"The President's Water Resources Policy Commission suggests that an entirely new system of government be set up throughout the country." This is how the Engineers Joint Council's National Water Policy Panel interprets the significance of proposals in the commission's report made public last December. While that report was being prepared, the panel made a very complete study of the problems involved and submitted it with recommendations to the commission. As with proposals of other reliable agencies these were almost entirely ignored by the commission. Now the panel has published a critique of the report, and a revision of its "Principles of a Sound National Water Policy."

In spite of the many areas in which there is mutual agreement, the panel states, "It must record distinct disagreement with a series of proposals for implementation which appear to violate completely the sound principles acclaimed." Throughout the report the panel finds the emphasis "almost universally on federal direction and control." It points out the commission's recommendation that the federal government develop the remaining hydroelectric resources. "The commission's proposals represent practically a completely planned economy for each planning area, with authorities responsible to the President only and beyond the control of the state and local government," the panel states.

In contrast to the socialistic schemes of the WRPC we are fortunate in having the sound recommendations of the Engineers Joint Council. As to objectives there may be little difference in the two proposals. But the methods are entirely different. The EJC emphasized the need for general principles in national water policy that would provide the following:

Local, state, and private responsibility should be pre-eminent in water project programming, execution, and financing.

Bookkeeping should be clear and forthright and should be based upon full inclusion of all costs and reimbursements.

Beneficiaries should pay costs, while general intangible benefits should be regarded as a margin of advantage in project selection.

Legislative authorizations and policies should be uniform for all federal agencies responsible for water resources development.

This latest contribution of EJC to the development of a national water policy should stand as a model for those who thoughtfully study the problem or who have the responsibility for taking legislative action. Its proposals for developing power are realistic and can be adopted easily in most respects by those who wish to preserve private enterprise in this field. Electric utilities are now obligated to see that every man, woman, and child has at his disposal a simple statement of the problem and the logical solutions as outlined by the panel. Each federal and state legislator must be adequately briefed on these fair, equitable, and unbiased principles.

Although we see many dangers in this procedure, it also may be advisable to follow the panel's recommendations to ask Congress to set up either a joint committee or a commission which should be charged with coordinating all legislative proposals and welding them into the equivalent of an overall statement of national policy. We suggest, however, that this might be delayed until a more favorable balance of power exists between the executive and legislative branches of the federal government.

An End to the Confusion

Recent months have seen the use of trade-marks and trade-names for electric power cable, wire, and insulating materials grow in a rising tide. Certainly we must pause to admire those who fabricate these titles for their ability to retain the flavor of the company name while throwing in a dash of the basic ingredient for good measure. But the list has grown so large that both maker and user have raised their voices against the confusion.

Although many wire and cable manufacturers have compiled their own lists of trade-marks and trade-names, it remained for Harry G. Burd, vice president of Ansonia Electric Co, to supply the impetus for a complete listing to clarify the situation. A survey based on his compilation was sent by Electrical World to over 60 wire and cable manufacturers asking them to list their products and describe them briefly. Through their cooperation we have been able to compile a list of over 400 names of wire, cable, and insulating material, which is presented on Page 142.

In listing the trade-mark or name, manufacturer, and use for which the product is designed, Electrical World hopes to restore some semblance of order to a situation where confusion is mounting.

Conservation in Generators

The ability of manufacturers to meet generating capacity expansion goals hinges primarily on the supply and conservation of materials. It is therefore encouraging to see that major manufacturers have made and proposed design changes which save metal in generators. One company is forcing the cooling hydrogen at higher velocities through the machine, thus extracting the rotor heat at a greatly increased rate. The claim is made that a 60-Mw machine of this design requires 250 sq ft less of floor space, which means less metal for both machine and building.

Another manufacturer has designed hollow rotor conductors through which cooling hydrogen is passed to absorb the loss-heat at its very source. Use of the same hollow conductor design in the stator may work the material thermally to still further limits.

Both of these methods of extracting heat from the rotor will permit either larger machines or machines with more capability per ton of metal. And because these improvements will reduce the limitation of generator size due to rotor heating, the generator will be able to catch up with its prime mover in terms of higher practicable size. This will permit on a capacity-basis the conservation of material inherent in larger sizes of turbines.

A third manufacturer has proposed that a sizable potential saving can be made by fitting the electrical design characteristics of the generator to the stability needs of modern power systems. It is not generally realized that short circuit ratio largely determines not only the physical dimensions of a machine, and amounts of material required, but also the stability characteristics during system disturbances. High short circuit ratio may have been considered necessary in the days of slow excitation pickup, scant capacitoring of the system, and comparatively few transmission transformers with tap changing under load. But now that extensive capacitor banks, regulating transformers, and prompt excitation response are in general use, is a high short circuit ratio still a necessity, particularly when it costs money, materials, and space to achieve?

The manufacturers of generators are looking at fundamental ways to conserve shortened stocks of metals by using them more effectively. It behooves the utilities to be critical of specifications which result in ineffective use of materials and conversely, to examine carefully proposals which definitely work materials to their maximum feasible effectiveness.

They Don't Learn Economics

If you have been wondering why the average American knows so little about economics and the free enterprise system, you can blame the public schools. They just don't teach economics. A survey by the Brookings Institution reveals that less than 5% of all high school students take the equivalent of a semester course in that subject.

What is even more serious, the texts used are incomplete as to subject matter; and none of the authors is a professional economist. The texts studied all ignore the factors responsible for economic growth and rising living standards. Little emphasis is placed on the significance of technology in increasing production efficiency. Little attention is paid to business organization, the problems of management, profit-sharing plans, or the effective size of companies.

The authors were all high school or college teachers. They have had little opportunity to obtain experience in and with the actual organization and operation of the American business system.

And the teachers who will interpret these texts to the students, how well informed are they? The institution points out that it is possible in some states for these teachers to have as few as three college credits in economics to be certified to teach the subject. And very often the college courses do not include practical applications of the principles taught.

The results of this survey should alarm every American businessman. They should alarm him enough to get together with the other business leaders of his community in demanding that a good economics course be made part of the curriculum of their local high school and that it be made a required course for graduation. That is the only way that the public will ever become somewhat informed about economics, the one course that will explain the importance of the free enterprise system and the American way of life.

The Electrical Week

INDUSTRY MOBILIZATION—(page 111) . . . Electrical equipment manufacturers are getting NPA directives at an 80-a-week clip . . . REA cooperatives receive first quarter allotments . . . NPA plans to recall portion of first quarter advance allotments made to equipment manufacturers . . . Boyles leaves NPA's Electrical Equipment Division . . . Depa assistant tells how administration distributes material allotments to utilities.

WASHINGTON—Dr Thomas H. Johnson appointed director of Research Division of U. S. Atomic Energy Commission (p 108) . . . Interior Secretary Chapman asks Appeals Court to rehear Roanoke Rapids case (p 109) . . . Congressional staff group making study of nation's electric power supplies and requirements (p 113) . . . BPA appoints Morgan D. Dubrow as Washington manager (p 113) . . . Dr Frank Wenner appointed to consulting staff of National Bureau of Standards (p 113).

ELSEWHERE—Sixty nine tons of transformer rides sidesaddle into the desert (p 104) . . . Engineer shortage and polyethylene considered at AIEE fall general meeting in Cleveland (p 106) . . . O. Titus becomes president of Penelec as William H. Doran succeeds him as head of Metropolitan Edison (p 108) . . . Substation designs vary greatly, PEA Electrical Equipment Committee symposium shows (p 110).

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Latest from Washington—Certificates of necessity for accelerated tax amortization are issued to Central Arizona Light & Power Co and Public Service Co of Colorado. Beginning Jan. 1, certificates will not be issued for projects already under construction . . . NPA, which alloted every bit of brass mill products available, has not a scrap to meet hardship cases . . . Final estimates for watthour meter production during this year and next are being readied for release . . . Green Mountain Power Corp, of Montpelier, Vt., asks FPC authority to build a $550,000 hydro plant on the Waterbury River . . . City of Tacoma still holds out hope that FPC will override its examiner and grant a license for the Cowlitz Project . . . Special House committee recommends against inclusion of federal income taxes as a cost-of-living item in government's consumer price index.

Pending outcome of negotiations by seven PUD's for joint purchase of Puget Sound P&L's remaining properties, a federal court has postponed until April a condemnation suit begun against the company by Skagit County, Wash.

Latest from Southwest—agreement on power integration between Southwestern Power Administration and 15 private companies is expected to be reached at a meeting scheduled for today in Tulsa, Okla.

Sunbeam Corp files a $6-million damage suit against R. H. Macy & Co, charging store tried to monopolize New York sales of Mixmasters during price war last May.

Fees and Salaries Committee of New York State Society of Professional Engineers, in a report just out, recommends these minimum salaries to be set: Professional Engineer, $7,200-$8,400; Engineer-in-Training, $4,200.

Reclamation Commissioner Michael V. Straus will spend the next month and a half in Latin America, discussing reclamation problems with six governments.

Latest from West Coast—BPA says all available steam plants will be in use this week to stave off a shortage, but interruptible load to aluminum plants will be carried to mid-month regardless of stream flow.

Boston Edison Co will meet Nov. 13 to consider successor to Pres James V. Toner, who died Oct. 19.

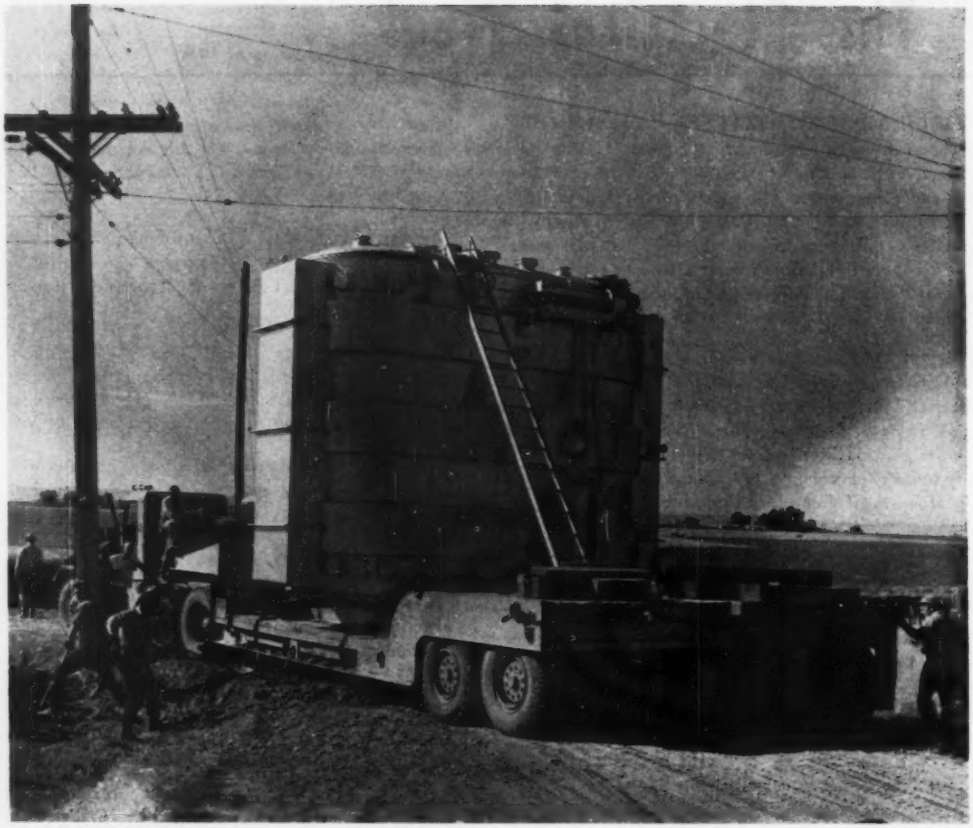
Latest from Southeast—Duke Power Co offers to sell bus franchise and buses in Charlotte, N. C., for $435,000 . . . First hearing by FPC on plans of Blue Ridge Electric Membership Corporation to build a dam on south fork of New River in North Carolina will be held Nov 27 in West Jefferson, N. C.

Westinghouse sales in first nine months of 1951 soared to new record of $901,042,000, an increase of 23% over same period of '50. Net income after taxes for the period was $42,757,000, a 12.9% decline. The company will spend $8 million to promote appliance sales in fourth quarter, double amount spent a year ago.

A new record high for 1951 output was set in the week ended Oct. 27 with a total of 7,233,928,000 kwhr.

Middle South Utilities, Inc, has discontinued negotiations for acquisition of a controlling stock interest in Arkansas-Missouri Power Co.

Congratulations—Emery D. Sherwin is new president of San Diego Gas & Electric. H. A. Noble succeeds him as vice president of operations . . . Pennsylvania Power & Light names J. M. Huebner vice president and R. C. Swartz vice president of the commercial department.



EDEN SUBSTATION of Idaho Power Co was the goal, this 90-deg turn one of the hazards, as 15,000-kva, 138/24.3-13 kv transformer was moved across ten miles of Idaho desert to Magic Valley site. Snake River canyon is just beyond pole

The Flatcar Bent, the Trucks Strained

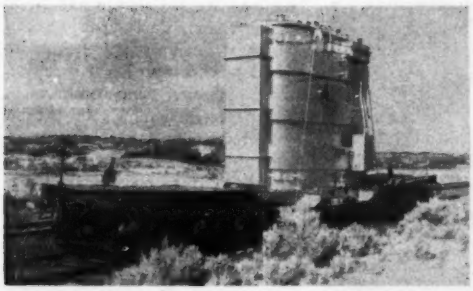
But Idaho Power's new 69-ton transformer fared well on its ten-mile trek over country roads to the company's Eden Substation

"We'll build a transformer any size a utility wants it," a manufacturer said recently. "The only limit is the size of the flatcar we can get to transport it."

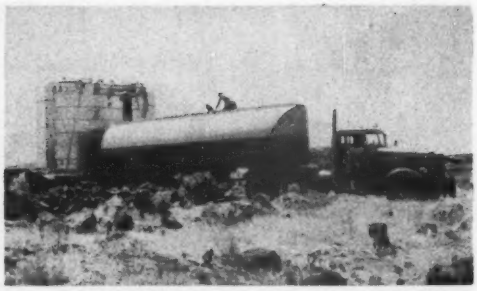
Idaho Power Co pressed that limit when it asked Pennsylvania Transformer to supply a huge, 15,000-kva unit for its Eden Substation at Magic Valley, ten miles across desert country from the nearest railroad siding. The transformer company built the unit, put it on the biggest flatcar available, and shipped it to the siding. Idaho Power took over from there—with two semi-trailers, a tank truck, tractors, and a line crew to relocate poles and remove obstructions that got in the way. When the unit arrived at the siding, the center frame of the flat car was scraping the rails. Draining the oil into a tank truck brought the transformer's weight down to 138,200 lb. This was still too great a load for one trailer, so two were used in tandem, with the transformer straddling their saddles.

Much of the trip was over narrow country roads. The tandem was not able to pull around some of the 90-deg turns, and tractors had to help out. Bridges across irrigation canals along the route had been reinforced in advance to carry the combined weight of trailers and transformer. There were no mishaps.

Four hours after the trek began, the twin trucks were eased between the substation's gateposts, with five inches to spare on either side. Mounting the unit, the utility reports, was relatively easy.

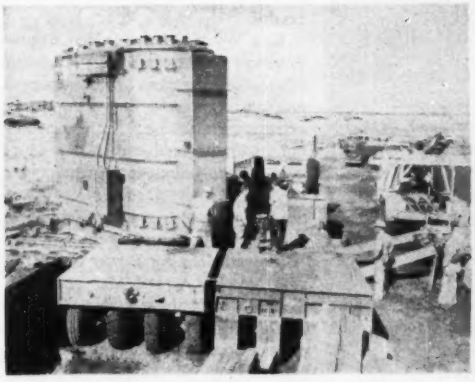


1 FLATCAR'S center frame was scraping the rails under the weight of utility's transformer when it arrived at the siding



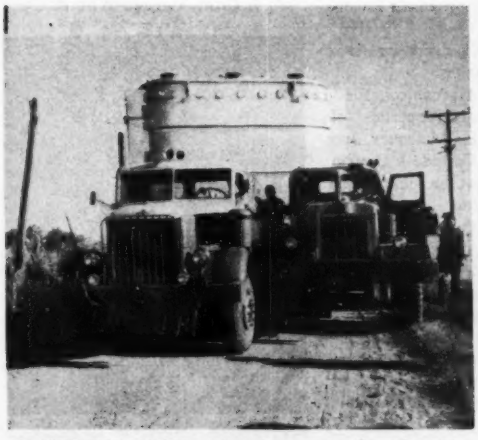
2 DRAINING unit's oil into tank truck brought weight down to 138,200 lb, making it easier to load it on trailers

Trailers in tandem carted transformer into desert

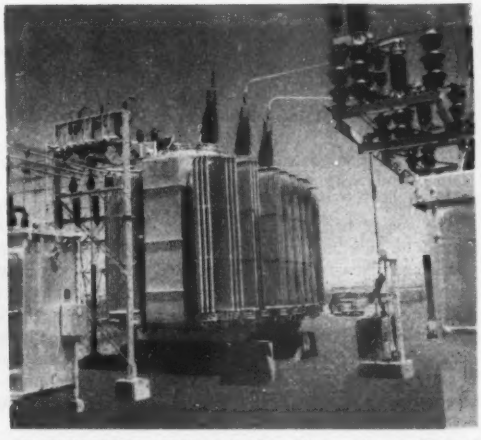


3 TRANSFORMER was turned on to semi-trailers by crew using tow truck. Load was too great for single trailer

4 LIKE a land dreadnaught the assemblage moved down an Idaho highway toward magic Valley on edge of the desert



5 COUNTRY ROADS made going worse near destination. Tractors tagged along to help trucks pull around turns



6 FOUR-HOUR TREK ended at Eden, where unit was mounted. Trucks had ten-inch clearance through the gate

AIEE FALL MEETING at Cleveland brought together J. C. Strausburger, left, institute's vice president; F. O. McMillan, the group's president; and Dr Keith Glennan, a member of the Atomic Energy Commission who gave main address

Engineer Shortage and Polyethylene Considered at AIEE's Fall Meeting

Electrical engineers must take steps to enlarge the supply of capable engineering graduates, Dr Keith Glennan, a member of the Atomic Energy Commission, told the fall general meeting of the American Institute of Electrical Engineers. The meeting was held in Cleveland Oct. 22-26.

Glennan said the nation's atomic energy program now engages 1,500 electrical engineers. AEC's large expansion program, as well as that of the power industry, will demand more engineers than are in sight, he said. He urged AIEE members to impress their managements with the seriousness of the shortage.

The commission, he said, was delighted to have the collaboration of power and chemical companies in the nuclear power program. However, he said he thought it would be many years before nuclear plants would produce even as much as the 5% of national generation the AEC soon will be consuming.

Elmer Lindseth, president of Cleveland Electric Illuminating Co, told the system engineering session that load in 1981 will be seven times the present load, plant five times as extensive, and investment about $150-million on the basis of past experience.

He urged engineers to develop sound, thorough, and uniform methods of presenting the relative economic merits of alternative proposals for expansion.

A symposium on polyethylene was a feature of the meeting.

In their paper, "Mechanical, Electrical, and Physical Properties of Polyethylene," A. E. Maibauer and N. R. Smith, Union Carbide & Carbon Corp, pointed out that the cable design engineer must consider operating requirements against the economics involved in choosing between a polyethylene of high molecular weight and one of low molecular weight. As has been historically the case with most polymers, the higher molecular weight grades of polyethylene can meet more severe operating requirements, but cost more than lower molecular weight grades.

The paper, "Fabrication, Specifications, and Applications for Polyethylene," by W. J. Canavan and N. R. Smith, Union Carbide & Carbon, stated that use of polyethylene for coverings or jackets over line wire, service drops, lead power cable, control cable, and series street lighting cable is being considered by the National Production Authority.

A. J. Warner, Federal Telephone & Radio Corp, added that non-military supplies of polyethylene were being restricted to high frequency applications.

According to the paper, "Polyethylene for Wire and Cable," by Victor Wallader, Bell Telephone Laboratories, a coating of aluminum powder provides a 250% increase in service life. But because of polyethylene's "waxy" surface, attempts at applying a long-lasting coating on it have been unsuccessful.

Ken Wyatt, Phelps-Dodge Copper Products Co, in contrasting American fabrication practices with European methods, explained that a two-screw extrusion machine, with vacuum pumps at the feed end, will produce void-free polyethylene on conductors. He said practices abroad make use of three-layer extrusions to eliminate voids in the polyethylene insulation.

"Polyethylene for Power Cables," a paper by W. A. Del Mar and E. J. Merrell, Habirshaw Cable & Wire Co, disclosed that mechanical failures of early applications of 5-kv cable with polyethylene insulation have been remedied by either a sheath of polyvinyl chloride or a metal shielding tape.

P. J. Croft, Canada Wire & Cable

PRES ELMER LINDSETH of Cleveland Electric Illuminating Co, was a principal speaker on the fall meeting program

Co, in his paper, "Power and Control Cable in Canada and England," said practice in these two countries favors injection-molded joints over taped-on joint insulations, provided the molded joint can be made as void-free as the cable insulation.

In the paper, "Polyethylene-Application to Street Lighting, Line Wire, and Control Cable," J. M. Geiger, Niagara-Mohawk Power Corp, said the service record of polyethylene has been gratifying in installations such as insulated wire for buried duct service on 5-kv series street lighting circuits, central station control service, and small-size 5-kv overhead distribution conductors. The service record of polyethylene street lighting cable in the Buffalo areas is unmatched by the service record of other types of cable in the same class of service.

Urges Heat Barrier Use

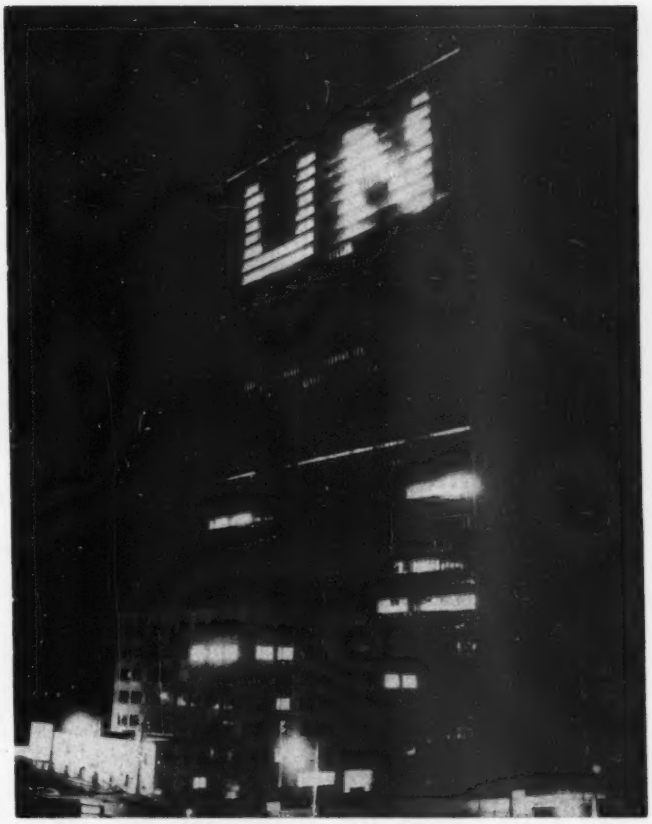
However, Geiger stressed that the low melting point of polyethylene suggests that some form of heat barrier should be used in making connections to the lighting receptacle to protect the insulation. Use of this heat barrier is not restricted to polyethylene alone, since other materials have proved inadequate in withstanding the heat.

The commonly accepted Schafer method of resuscitation should be discarded as soon as a superior "push-pull" methods can be taught. This was the assertion of Dr A. S. Gordon and three associates on the medical faculty at the University of Illinois in a safety session.

Fire Fighting Discussed

Best methods for fighting fires in generating stations were discussed at a meeting on power generation.

"Fire Protection in Electric Stations," by H. A. Bauman and W. E. Rossnagel, Consolidated Edison Co of New York, favored mobile equipment (fog or spray) for combating fires in narrow aisle, high gallery compartments. Dry chemicals have been used successfully to extinguish Class A fires, although they will not put out deep-seated fires of this class. They said Consolidated Edison favors dry chemical extinguishers for all-duty portable equipment and fog-type extinguishers for heavy duty equipment. Highly trained crews are just as important as adequate equipment for successful fire fighting, the utility reported.



FLUORESCENT LIGHTS in the 38-story United Nations Secretariat headquarters in New York were patterned into a huge electric sign to mark UN's sixth anniversary

Oregon Utility Files Suit Against City Ordinance

Mountain States Power Co, Albany, Ore., recently filed an application in Circuit Court for a permanent injunction against a Springfield, Ore., ordinance requiring the utility to obtain permission from the city utility board before installing or operating any equipment.

The ordinance also provides that all future utility installations and operations must conform to the national safety code. The utility board operates Springfield's electric system.

Calling the ordinance "a related step in a conspiracy," Mountain States Power asked in its suit that the ordinance be declared unconstitutional on the ground that it would deprive the company of property without due process of law. The utility's Springfield manager stated that the city utility board could delay and hamper service to the company's customers.

The part of the ordinance requiring conformity with the national safety code was described by the company as "arbitrary and unreasonable as it would apply to Mountain States Power Co operations and not to the competing City of Springfield electrical system."

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Grants 25-Year Franchise

The Auburn, Wash., city council has granted a 25-year franchise to the Puget Sound Power & Light Co for installation and maintenance of power company facilities on municipal property.

O. TITUS

WILLIAM H. DORAN

Titus Named President of Penelec; Metropolitan Edison Appoints Doran

O. Titus, for the last ten years president of Metropolitan Edison Co at Reading, last week was elected president of Pennsylvania Electric Co. He succeeds David W. Jardine, who asked to be relieved of his duties after serving a year beyond normal retirement date.

Metropolitan Edison's directors immediately elected William H. Doran, the company's executive vice president, to succeed Titus as president.

A native of Rochester, N. Y., and a graduate of Yale University, Titus joined the Rochester Gas & Electric Co in 1919 as a cadet engineer. In 1930 he accepted a position with New York State Electric & Gas Corp and four years later was elected a vice president. In 1938 he became executive vice president and a director of the corporation. He continued in that capacity until January, 1941, when he was elected president, a member of the board, and chairman of the executive committee of Metropolitan Edison.

Jardine came to Penelec in 1943 with the merger of Erie County Electric Co, of which he was president. A graduate of Lehigh University, he has been in the public utility field since 1907 when he joined American Gas Co. Elected president of Burlington (Vt.) Light & Power Co in 1924, he later served as a regional vice president of Philadelphia Electric Co. He had been president of Penelec since 1946.

Doran, a native of Buffalo, began his utility career in 1922 when he joined Depew & Lancaster Light Co in Lancaster, N. Y. Several years later he went with New York State Electric & Gas Corp, and in 1938 was elected a vice president. He resigned this position in 1941 to join MECo.

MECo elected him vice president shortly afterward, and in 1946 promoted him to executive vice president.

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Meter Supply Adequate, PEA Committee Hears

National Production Authority has the hope that enough watthour meters will be available to supply essential needs in the period ahead, according to O. K. Coleman, consultant to the Technical and Scientific Division of NPA.

Speaking before the Pennsylvania Electric Association Meter Committee at Oil City, Coleman, vice president of Duncan Meter Co, estimated that in 1951 supply of new meters will be 70% of a normal year. In 1952 the supply will be about 70% of 1951, or half the supply in a good year.

Key to this relatively fortunate situation, Coleman said, is the realization by NPA that meters are essential in preventing "runaway" use of electricity by unmetered customers. It has been shown an investment of one pound of copper in a watthour meter will save 15 lb needed on the system to supply extravagant energy uses of one unmetered customer, he added.

To help NPA in its efforts to supply copper for needed meters, Coleman asked utility metermen to do three things: (1) Order meters as far ahead as possible, (2) rate all orders and (3) order no more meters than are actually needed. Plan ahead, plan factually and accurately, he urged.

Round table discussion of 1951 National Electric Code changes focused on clearance requirements for service wires over roads and residential driveways. Difficulties were cited in attaining these clearances on low ranch-type houses without resort to "periscope" services on roofs. Robert A. Markle said Pennsylvania Electric Co installs a pole across the street from the primary line to raise service wires to the proper height above roads.

L. J. McMackin, Metropolitan Edison Co, said his company is being asked to supply service to 25-watt boosters at 1,000- to 1,500-ft intervals along the coaxial cable of companies supplying television antenna service in the Reading area. Such cables are mounted on joint-use pole in space between electric and telephone conductors.

Application of the "bar-X" and "sigma" method of calculating standard deviations to the analysis of accuracy data on large quantities of watthour meters, was described by Floyd Busch of General Electric Co. He explained that it was difficult for a meter manufacturer to juggle meter accuracy back and forth to satisfy various utility meter departments. As a consequence, GE follows the practice of guaranteeing a specific average accuracy and standard deviation. He urged utilities to familiarize themselves with the method and apply it to the analysis of their own test results.

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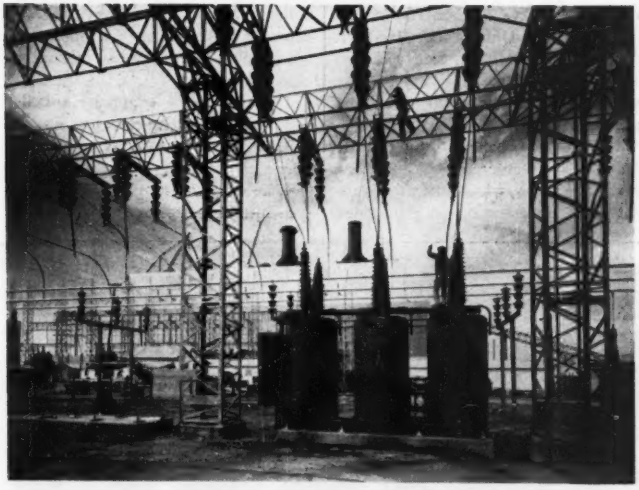
Appointed to AEC Division

Dr Thomas H. Johnson, chairman of the physics department of the Brookhaven National Laboratory, New York, has been appointed director of the Research Division of the U. S. Atomic Energy Commission. His appointment, which becomes effective December 1, 1951, fills a vacancy caused by the resignation last June of Dr Kenneth S. Pitzer.

TVA's New Johnsonville Plant . . .



Sends First Power Into the System

First power from Johnsonville Steam Plant of Tennessee Valley Authority was fed into the system network last week as the first of six 112,500-kw units was put into operation.

Construction work on the plant (top picture) and adjoining switchyard (lower picture) is nearing completion. Site of the plant is on Kentucky Lake in western Tennessee between Kentucky and Pickwick Dams. TVA is building five other steam plants: Shawnee in Kentucky (to supply Atomic Energy Commission's plant at Paducah; EW, Sept. 24, p73), Colbert and Widows Creek in northern Alabama, and Kingston in eastern Tennessee.

The Johnsonville unit now in operation will generate in one year more than half as much power as was generated in the entire Tennessee Valley region in 1933, according to TVA. Boiler will operate at 1,450 psi, 1,000 deg F.

New U. S. Water Policy Is Urged in EJC Study

A new system of government consisting of river basin authorities more powerful than the state governments would result if the recommendations of the President's Water Resources Policy Commission were followed, the Engineers Joint Council charged last week.

The charge was made in a critique of the commission's findings (EW, Dec. 25, p 4) issued in conjunction with "Principles of a Sound National Water Policy," an EJC report. The report is a revision of a statement submitted to the PWRPC last year.

Although theoretically, EJC stated, the reports drawn up by the commission and the council have much the same objective, the council recommended the use of "cooperative methods under our present form of representative government," while the commission put its emphasis "almost universally on federal direction and control."

The EJC report asserts that federal water programs are not satisfactorily coordinated between agencies, and that they are proceeding in the absence of a comprehensive water policy.

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Chapman Asks Appeals to Rehear Rapids Case

Still unwilling to admit defeat in the Roanoke Rapids case, Interior Secretary Oscar L. Chapman last week asked the Fourth Circuit Court of Appeals, which had previously decided against him, to rehear the case (EW, Oct. 15, p 5).

Interior's counsel, Gregory Hankin, would not say whether this action was preliminary to an appeal to the Supreme Court.

In the petition for rehearing, filed by Hankin, it was argued the court had erred a number of times in its opinion upholding the federal license granted Virginia Electric & Power Co to build the $27-million Roanoke Rapids hydroelectric project.

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Named to Indiana PSC

Wendell Tennis has been appointed a member of the Indiana Public Service Commission.

Substation Designs Vary Greatly, PEA Committee Symposium Shows

Except in their common objectives of low cost, simplicity, ease of expansion, and minimum maintenance, substation designs of major power companies in Pennsylvania appear to have little in common.

This was apparent from the comparison of designs of seven leading companies participating in a symposium that was the feature of a meeting of the Electrical Equipment Committee of the Pennsylvania Electric Association in Altoona, Oct. 22-23.

Material Conservation Evident

Efforts to conserve materials were evident in all structures, whether they were of steel, wood, or aluminum. A gradual swing to the use of pillar-type supports was seen in some newer stations as was a movement away from lattice-type girders and toward rolled structural shapes that are more easily painted.

E. N. Cue said Duquesne Light Co had found the painting cost of rolled structural shapes to be about one third that of lattice girders.

W. B. Morton said Pennsylvania Power & Light Co's use of models had proved their value in developing the five basic substation designs used by that company. PP&L will use oil breakers of watch-case design in a new 220-kv substation to eliminate the need for permanent oil piping.

Use of Steel Cut

Philadelphia Electric Co engineers now consider duplicate facilities a luxury in modern substations, K. S. Garret said. Simplicity, economy, and minimum use of steel in the company's new Emilie substation resulted from use of 12-in. standard vertical steel pipe supports for tubular type buses.

Since 1944, when Pennsylvania Electric Co built its first substation using aluminum, four more have been installed and two are on order. Although the cost is more than 140% of that of steel, speed of erection and freedom from painting and outages associated with painting are offsetting factors.

Nine steel-detail plans handle all 26-kv substations used by Public Service Electric & Gas Co, according to A. W. Hawkins. An expandable steel bay of the rack type is used with 4-kv individual feeder equipment in a unique roofed "house" that contains the breaker, reactors, and regulators.

Also participating in the substation symposium were manufacturers' engineers including B. K. Smith, Westinghouse Electric Corp; A. H. Power, General Electric Co; B. F. Campbell, Delta-Star Electric Co; and Edward Williams, Railway & Industrial Engineering Co.

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Distribution Conference Considers Capacitor Use

The most economical use of capacitors in a power system employs them to handle 66 kva of each 100 kva of peak, P. H. Underwood, Houston Lighting & Power Co, said recently. Half the capacitors should be switched, the other half fixed, he added.

Underwood spoke at the Power Distribution Conference of the University of Texas, which met in Austin. He based his assertion on experience gained through using this combination on the Houston system.

Despite this, H. W. Wahlquist, Ebasco Services, Inc, told the group capacitors today handle only 25 kva of every 100 rkva of peak.

Underwood said power companies could expect to install more switched capacitors as industrial customers became aware of savings to them from power factor correction.

Wahlquist said inductive coordination problems caused by capacitor installations could be solved in one of two ways:

1. By upsetting the resonant condition by installing more or fewer capacitors, changing their location in the circuit, or installing a small reactor in the capacitor.
2. By operating wye-connected capacitors with a floating neutral.

Inductive interference problems resulting from installation of capacitors can sometimes be solved by telephone system changes, according to W. E. Bloecker, American Telephone & Telegraph Co. These corrective changes include:

1. Shielding of telephone circuits.
2. Balancing telephone circuits.
3. Reducing susceptiveness of telephone equipment.
4. Draining off longitudinal voltage.
5. Installing chokes.

PRES FRANK W. BIRD, for whom Montana Power Co's 66,000-kw steam plant at Billings was named, checks details of recent dedication with George M. Gadsby, EEI president; W. L. Murphy, Montana Power director; and J. E. Corette, Jr, vice president and assistant general manager. More than 7,000 persons visited new plant

Electrical Equipment Makers Get NPA Directives at 80-a-Week Clip

Electrical equipment manufacturers, probably more than any other segment of industry, are feeling the impact of National Production Authority directives.

These are the formal orders sent out to manufacturers calling for changes in production schedules to speed up delivery of specific items. They may direct moving a unit ahead on the order board, or set a date on which the item must be shipped. Directives are authorized for use only in emergencies pertaining to the national interest.

Issues 80 Directives a Week

NPA's Electrical Equipment Division, claimant agency for manufacturers of such items as transformers, switchgear, and motors, estimates it is issuing directives at an 80-a-week clip. Since all of NPA is sending out only 150 to 200 a week, it is evident that EED is carrying more than its share of the directive load.

While most of the directives are issued in connection with Defense Department or Atomic Energy Commission-sponsored projects, a few are going out to speed completion of light metals and steel expansion projects.

Industry, in general, thus far has received relatively few directives, but manufacturers of switchgear and heavy motors are getting them in increasing numbers. In some instances, these directives may explain why manufacturers have had to delay delivery of such equipment ordered by utilities.

Discuss Directives' Impact

On the surface, it would appear that use of directives would play havoc with manufacturing schedules. But thus far the NPA divisions have not issued directives before discussing their impact with the manufacturers.

In the great majority of cases, the needed changes in schedules can be arranged with a minimum of disturbance to the orderly delivery of items on the order boards.

The directives are necessary to make schedule-readjustments legal since manufacturers are required by order M-44 to follow NPA-approved order boards.

Engine and Turbine Division of NPA, claimant agency for manufacturers of such items as turbines, boilers, and heat exchangers, has not yet resorted to use of directives mainly because these larger items are custom-made, have long lead-times and schedules already approved fit into the general construction pattern of defense and defense-supporting projects. But ETD is considering issuing some directives in the near future.

Defense Electric Power Administration, claimant agency for the electric utilities, has no authority to issue directives. It can only request that they be issued by the proper NPA division. A number of requests have been filed, and some have been granted.

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REA Cooperatives Get 1st Quarter Allotments

Rural Electric Cooperatives have been alloted about 2% of the steel, 13% of the copper, and 28% of the aluminum which will go to electric utilities during the first quarter of 1952.

CMP allotments for the cooperatives are distributed by the Rural Electrification Administration in Washington under an agreement with Defense Electric Power Administration.

Actual amounts of the controlled metals alloted rural cooperatives are:

Steel (all types)...	7,451 tons
Coper and copper base alloys	10,496,000 lbs
Aluminum	11,308,000 lbs

Advance allotments for the last three quarters of 1952 based on actual allotments for the first quarter were also announced. They amount to 60, 50 and 25% of the first quarter allotment.

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NPA to Recall Material from Equipment Makers

Because of the curtailed material allotments for the first quarter of 1952, some electrical equipment manufacturers will have to return a portion of their advance allotments assigned previously.

This allotment recalls will hit some transformer, switchgear, and pole-line hardware manufacturers. Amount of the recall will depend on the defense orders held by such manufacturers.

National Production Authority's Electrical Equipment Division will shortly issue forms recalling the allotments.

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Boyles Leaves NPA Post

R. C. Boyles has returned to his position with Line Material Co in Kansas City, Mo., after serving nearly a year in the mobilization program. His post as chief of the pole line equipment branch of Electrical Equipment Division of National Production Authority is vacant for the time being.

Dead Set to Damn Depa? Well, Before You Do . . .

How does Defense Electric Power Administration go about distributing material allotments to utilities? In a speech last week, Francis A. Kolb, special assistant to the Depa Administrator, gave these principles:

"Our general po'icy is to take care of the most urgent projects first. One of the ways we judge urgency is by the power supply situation in an entire region. We try to determine the actual date when the project will be needed to carry load. Projects for 1952 take precedence over 1953 projects.

"For the first quarter of 1952, we have not received enough structural steel to take care of all the generating stations that must be built. However, we must have a balanced program, so we have arbitrarily taken a limited amount of structural steel and set it aside for transmission towers and substations.

"In the distribution of copper and a'uminum, we generally give to transmission over distribution because the quantities which are given to utilities on a self-certifying basis are generally used to meet distribution demands."

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE 1951									
Oct. 25	2.94	2.99	3.11	4.15	4.41	4.71	5.50	6.29	7.12
Oct. 18	2.91	2.96	3.09	4.13	4.34	4.67	5.44	6.21	7.01
END OF QTR.									
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44

Data: Kelley & Chandler, Inc.

West Penn Power Gets $4.5-Million Rate Boost

The Pennsylvania Public Utility Commission has granted West Penn Power Co the full amount of a requested rate increase filed early this year. The new rates, effective Oct. 29, will add about $4.5 million annually to the company's gross revenue and represent an overall price increase of slightly less than 10%.

The utility filed its petition for higher rates in February and in April the PUC suspended the application in order to study all information in the case. The commission subsequently conducted a thorough investigation at the company's request.

In North Dakota, the Public Service Commission has scheduled hearings for later this month in connection with the request of Northern States Power Co of Minnesota for increased rates in 21 North Dakota communities served by the utility. Northern States Power has not announced the amount of increase it seeks.

Higher rates for electrical heating loom for residents of Seattle, Wash. Seattle City Light is planning to invoke new rates Jan. 1 which would double present rates. The rates were originally scheduled to go into effect four years ago but electrical heating contractors secured a postponement to give owners who heated their homes electrically time to convert to other systems.

The current charge for electric heating is 0.7¢ per kwhr for the first 2,500 kwhr and 0.9¢ thereafter. The new rate would be 1.8¢ per kwhr for everything over 1,200 kwhr. Electrical heating represents a seasonal demand and pushes peak load up in winter, forcing City Light to purchase power from Bonneville Power Administration or resort to costly steam generation.

The number of City Light customers believed using electricity for heat now is placed at 5,000. If a fight develops to postpone the new rates again City Light is expected to threaten an overall rate increase.

FINANCIAL BRIEFS

Northern Indiana Public Service Co stockholders have voted to increase the authorized number of common shares from 4 million to 4.5 million. They also approved a new 240,000 share issue of $25 preference stock and a reduction in the $20 preference stock to 180,908 shares . . . **Commonwealth Edison Co** stockholders have voted to increase the authorized common shares from 16 million to 24 million and to authorize 6 million shares of $25 par preferred stock.

Iowa Southern Utilities Co has called for redemption Nov. 24 of all its outstanding (38,239 shares) 5½% cumulative preferred stock at $30.75 a share. Holders may convert their shares into common up to Nov. 23 at the rate of two shares of common for each share of preferred. The company has reserved 76,478 common shares for this conversion. First Boston Corp will purchase the common stock not converted.

Cleveland Electric Illuminating Co's purchase of Berea's municipal plant has been upheld by the Ohio Supreme Court. Consummation of the sale had been held up by a taxpayer's suit.

Common holders of Public Service Co of Indiana took 236,971 shares of 324,656 common shares offered at $28.25 on a 1-for-10 basis expiring Oct. 24; the balance of 87,685 shares were taken by Blyth & Co group.

Electric Utility Financing

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
	WEEK OF OCTOBER 25-31			
Bonds				
Utah Power & Light	1st mtg, 3⅝% 1981 new money	$ 9,000	101.3775%	3.55%
Ohio Power	1st mtg, 3⅜% 1981 new money	15,000	102.77	3.23
Ohio Power	Ser. notes, 3⅛% 1955/66 new money	7,000	101.633*	2.75-3.30
West Texas Utilities	1st mtg, 3⅛% 1981 new money	8,000	102.31	3.50
	WEEK OF NOVEMBER 1-7			
Bonds				
Rockland Light & Power	1st mtg 1981	$ 6,000	.....	.....
Common Stock				
Consumers Power Co	561,517 sh (1-for-10, record Oct. 17 to expire Nov. 2)	$17,969	$32.00	6.25%
	SCHEDULED NOVEMBER-DECEMBER			
Bonds				Bid Date
Florida Power & Light	1st mtg 1981	$10,000		Nov. 13
Detroit Edison	gen and ref bonds 1976	40,000		Nov. 14
Gulf States Utilities	1st mtg 1981	10,000		Nov. 19
Central Illinois Light	1st mtg	8,000		Nov. 27
Central Maine Power	1st and gen mtg 1982	7,000		Dec. 5
Virginia Electric & Power	1st mtg	20,000		Dec. 10
Preferred Stock				
Long Island Lighting	100,000 sh, $100 par	$10,000		Nov. 14
Commonwealth Edison	1,716,500 sh, cum conv, $25 par (to common holders on ratio of 1 sh pfd for each 8 common sh held on Oct. 30 to expire Nov. 14)	42,913	$31.00	4.26%
Common Stock				
Long Island Lighting	524,949 sh (1-for-7, record Oct. 24 to expire Nov. 8)	$6,824	13.00	6.15
Central Maine Power	315,146 sh (to be offered first to holders of 6% pfd and common with New England PS, parent and holder of 49% of the common, waiving its rights to subscribe for new common)	.....		Dec. 5

* Average price

Congress Staff Group Making Power Study

Staff members of the Joint Congressional Committee on Defense Production began breaking ground last week in a study of the nation's electric power supplies and requirements.

Basic question involved in the study is: What can Congress do to assure adequate electric power to meet the nation's defense and civilian needs? Results of the study, to be completed by Jan. 8, will be used to determine whether a full committee investigation is needed.

Utility officials have been asked to address their views on the question to Power Study Staff, Joint Congressional Committee on Defense Production, Senate Office Building, Washington 25, D. C.

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BPA Appoints Dubrow Washington Manager

Morgan D. Dubrow, formerly with the Water and Power Division of the Interior Department, is the new Washington manager for Bonneville Power Administration.

Before joining the Water and Power Division, Dubrow was hydrology liaison officer for the Reclamation Bureau. In his new position, he replaces John D. Davis, who has moved up to become deputy administrator of Defense Electric Power Administration.

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To Use Heat from Spring

Reclamation's Alcova hydroelectric plant 30 miles south of Casper, Wyo., will be heated by water from a nearby hot spring, the bureau reports. The spring flows at rates up to 400 gallons a minute at temperatures between 100 and 115 deg F. The bureau, which expects to begin construction soon on the 36,000-kw plant, plans to save $5,000 a year on heating bills.

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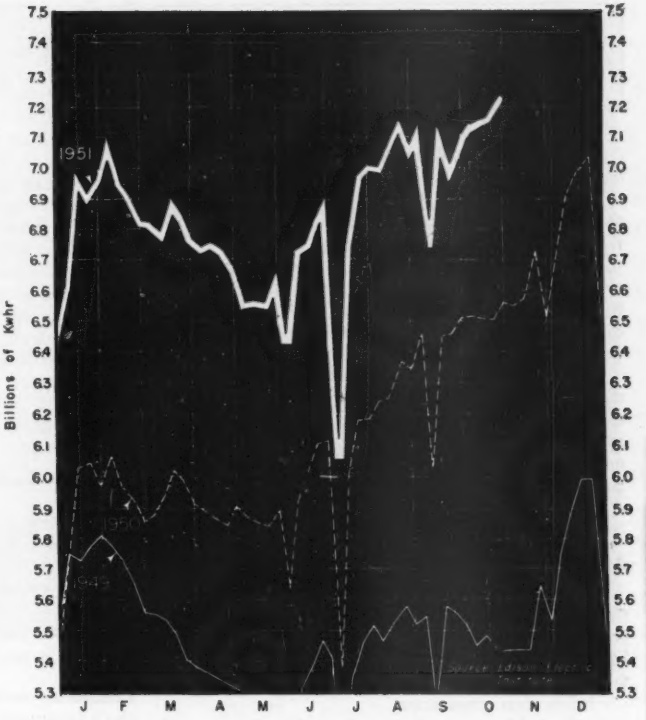
Wenner Joins NBS Staff

Dr Frank Wenner, consulting physicist of the development of electrical instruments for the Rubicon Co, Philadelphia, Pa., has been appointed to the consulting staff of the National Bureau of Standards, Washington, D. C.



Output Week Ended Oct. 27—7,233,928,000 Kwhr

Weekly Output, Millions Kwhr		
1951	1950	1949
Oct 27 7,234	Oct 28 6,563	Oct 29 5,433
Oct 20 7,149	Oct 21 6,503	Oct 22 5,430
Oct 13 7,160	Oct 14 6,509	Oct 15 5,481
Oct 6 7,156	Oct 7 6,514	Oct 8 5,450
Sept 29 7,102	Sept 30 6,503	Oct 1 5,521
Sept 22 7,014	Sept 23 6,457	Sept 24 5,556
Sept 15 7,138	Sept 16 6,449	Sept 17 5,579
Sept 8 6,795	Sept 9 6,029	Sept 10 5,258
Sept 1 7,146	Sept 2 6,459	Sept 3 5,544
Aug 25 7,077	Aug 26 6,346	Aug 27 5,523

Per Cent Change from Previous Year	Oct 27	Oct 20	Oct 13
New England	+ 4.4	+ 3.7	+ 3.1
Mid-Atlantic	+ 7.5	+ 7.5	+ 7.6
Central Industrial	+ 6.7	+ 6.6	+ 6.5
West Central	+11.7	+11.9	+12.0
Southeast	+14.0	+14.2	+13.4
South Central	+20.1	+18.7	+21.9
Rocky Mountain	+ 9.6	+10.8	+ 9.7
Pacific Coast	+13.1	+11.3	+12.0
Total United States	+10.2	+ 9.9	+10.0

MEETINGS

Texas A. and M. College
Public Utility Short Course for Electrical Metermen, College Station, Tex., November 5-9.

Pennsylvania Electric Association
Systems Operation Committee, Split Rock Lodge, Split Rock, Pa., November 8-9.

Northwest Public Power Association
Accounting Section, Governor Hotel, Olympia, Wash., November 8-9.

National Electrical Manufacturers Association
Chalfonte-Haddon Hall, Atlantic City, N. J., November 12-15.

California Municipal Utilities Association
Annual Conference, Hotel Leamington, Oakland, Calif., November 13-16.

★**American Society for Testing Materials**
Insulating Oil Symposium, General Brock Hotel, Niagara Falls, Ontario, Can., November 14.

Wisconsin Utilities Association
Electric-Gas Sections, Sales-Engineering Divisions, Schroeder Hotel, Milwaukee, Wis., November 14-16.

Instrument Society of America
Boiler Instrumentation Symposium, Bellevue-Stratford Hotel, Philadelphia, Pa., November 15.

New Jersey Utilities Association
Annual Meeting, Seaview Country Club, Absecon, N. J., November 15-17.

American Society of Mechanical Engineers
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., November 26-30.

Westinghouse Electric Corporation
4-H Farm-Home Electric Program Conference, Hotel Stevens, Chicago, Ill., November 28.

Pacific Coast Electrical Association
Annual Hawaiian Conference, Royal Hawaiian Hotel, Honolulu, T. H., November 29-30.

★**American Institute of Electrical Engineers**
Feedback Control Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., December 6-7; Winter General Meeting, Hotel Statler, New York, N. Y., January 21-25, 1952.

Public Utilities Advertising Association
Region 2 Meeting, Advertising Club of New York, New York, N. Y., December 7.

★**Chicago Lighting Institute**
Industrial Production-Safety Lighting Clinic, Chicago Lighting Institute Auditorium, Chicago, Ill., December 7.

★Addition this week.

WASHINGTON COMMENT

JESSE MOCK

When fighting battles before Congress, the most effective weapon to choose is the "constructive alternative."

Most Congressmen have a fine appreciation of fair play and the other principles widely esteemed. This appreciation is shown by such acts as repeal of the 3⅓% electrical energy tax this year. But before taking such an action, they usually want to know how this tax loss can be made up. It will be noted that the House committee once voted to extend the tax to public bodies before finally deciding to repeal it.

In the main, it is pretty weak strategy to rely on even the most condemning arguments to kill a measure before Congress. Such phrases as "socialistic scheme" have been bandied around so much before Congress that they have no meaning. A Congressional committee can hear a bill condemned with mere words all day and go right ahead and vote for it. Reason: Nobody came up with a better idea for accomplishing the purpose.

Give Congressmen a Choice

But given a constructive alternative, most members of Congress are more than willing to study the proposals before them and try to choose the better one. Besides having to live with their own conscience, they must be able to defend their ideas before their colleagues, and eventually before their constituents.

Confronted by a constructive alternative, they can kid neither themselves nor their friends with the brushoff: "I voted for it because it was the only proposal before us."

It is heartening to see that the electrical industry is making more and more use of constructive alternatives in its battles before Congress. Industry spokesmen are finding a more heartfelt welcome on Capitol Hill because they are bringing new ideas—constructive alternatives to the usual proposals by federal and other public power officials.

In a few instances this year the industry ideas have been accepted. In others, the final decisions have not been made. But the privately owned electric utilities are in a better position for having offered constructive ideas.

When the "Constructive Alternate" Worked

A good example of the effectiveness of the weapon came during the House action on funds for the Interior Department this year. This body denied a number of requests for money to finance federally constructed transmission lines after it was shown that private enterprise was able and willing to build these facilities.

Perhaps the climax came when one utility made a last minute offer to build and operate a $1-million line minutes before the House took action on the department's request. The House voiced its approval of the offer and went on to write an amendment which would force the Interior Department to accept such offers made in connection with Reclamation projects.

Constructive alternatives offered by electric utilities were also a factor in restricting the use of continuing funds by the Southeastern and Southwestern Power Administrations.

One of the more appealing reasons for using the technique of the constructive alternative is that it is an offensive rather than defensive weapon. No better illustration of this was offered during the year than when five New York state utilities offered to take on the redevelopment of the Niagara River hydroelectric potential.

Proponents of straight federal development found themselves retreating before a barrage of committee questions which would never have arisen if private enterprise had not offered to do the job. As a result of the offer, chances are good that the project will not be built by the federal government.

In using the technique of the constructive alternative, the utilities are simply using ideas to fight ideas. True the best ideas do not win at every turn, but they have a way of staying around to pester the conscientious public servant. In a democracy, there is always hope, and often a good chance, that the best ideas will eventually win out.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Subtransient currents arising with a single line-to-neutral fault may be up to 50% higher than for a three-phase fault.

Undisturbed earth, even when wet, is a poor conductor—in fact a fairly good insulator—for continuous currents.

Lamp filaments last longer if resistance to oxidation is enhanced by coating them with ceramics.

Microwaves are virtually static-proof but rain and fog do attenuate them; repeater stations are necessary, however, if distances exceed line-of-sight.

Water consumption (present average gross) is approaching 800 gallons per day per capita; meanwhile rainfall across the country is decreasing.

Hyperbolic natural-draft cooling towers of European practice are unfeasible here because the USA summer-time dry-bulb temperature is so much higher.

Soot-blowing with both air and steam might offer better results (none of the detriments of either) than either medium alone.

Vaseline (three drums of crude) generously applied to a 740-ft dam prevented adhesion of ice and averted the hazards of its removal.

Tap-changer knob position indicators could probably be standardized so that the No 1 position would represent the same end of the voltage range on all tap changers.

Centers of gravity clearly identified on bulky components of unit substations would make the task of handling the equipment easier for construction personnel.

DISTRIBUTION CIRCUITS suffered severely from fallen branches and uprooted trees and were out several days in some areas

What If This Fall Brings Another "Big Blow"?

Reported here is a summary of lessons learned by utilities in the Middle Atlantic States during the severe storm on November 25, 1950. Included are practices adopted and planned for future emergencies

Storms and weather-borne disasters have always been uniquely a utility problem. But over the years the big ones have brought with them a crop of hard-earned lessons in service restoration. The hurricanes in Florida now find utilities ready with a step-by-step procedure for marshalling men and materials. The ice storms of 1948 in the East fostered a disaster plan that lessened the hardships in last fall's Big Blow of November 25. And out of that storm have come still other lessons that will strengthen the preparedness of utilities in emergencies yet to come.

Considering the severity of last years storm the prompt service restoration achieved by eastern utilities may be credited to five factors:

1. The quality of design and maintenance of modern electric systems.

2. Two-way mobile radio communication.

3. Systematic programs of tree trimming.

4. Willing, efficient, and self-sacrificing efforts of the individual utility employee.

5. Public awareness of conditions.

On the other hand, damage might have been minimized by better weather forecasting. This and other lessons growing out of service restoration experiences following the storm are summarized here.

Mobilization for Service Restoration . . . The Big Blow emphasized the value of prompt manpower mobilization and the importance of providing work relief. Where it was done advance assignment of duties, establishment of methods and techniques, availability of forms, maps, and other materials paid off. Severity of the emergency determines how much outside assistance will be necessary.

Crew Fatigue . . . Fatigue on the part of work crews was understandably high. When the extent of the damage was comprehended, work relief measures were instituted by most companies. This was necessary so that crews would not be exhausted but conserved for effective use over the long pull that lay ahead.

In many companies schedules for the line crews and supervisors limited the working period to 16 hr. Some large crews worked from dawn till dusk. Small crews took over from midnight to 8 am. In this way reasonably fresh, alert crews were assured for the duration of the emergency.

Handling the Public . . . Handling the public became an acute problem. Some companies set up manpower to answer all questions and tell customers when service would be restored. Avoid vague answers they caution. Publicity regarding damage and steps being taken to restore service was effective in keeping the public advised and somewhat satisfied.

One company organized a "special treatment" group to handle calls involving service to hospitals, fire and police departments, public buildings, pumping stations, communication facilities, bakeries, dairies. This group expedited restoration of service and kept customers advised of progress.

Other companies reported that during the storm and afterward, the public relations office was given information to keep the public advised of the severity of the storm and extent of the damage, give progress reports and assure the customers that everything humanly possible was being done to restore service to them. This office prepared information for distribution via radio, advertisements and releases to newspapers, and municipal authorities.

Steps in Restoring Service . . . Since the storm new restoration procedures have been set up by several companies.

For instance one company procedure calls for . . .

A. Making rapid preliminary survey of the damage to estimate manpower and equipment needs.

B. Restoring the transmission system first; simultaneously with survey.

C. Restoring the distribution system according to a regular prearranged pattern (priority loading).

D. Restoring street lighting system.

E. Making permanent repairs and maintenance.

Another company has adopted this sequence of action . . .

A. Cut in the clear and de-energize all fallen wires.

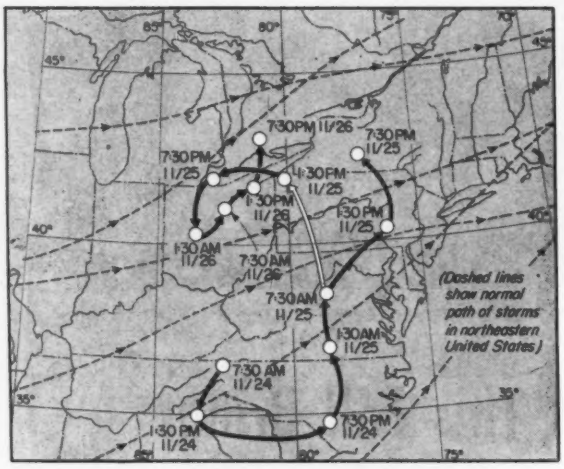
B. Restore service to hospitals, fire departments, and other essential public service institutions.

C. Repair lines over which service could be restored to the most customers.

D. Repair those lines which supply only a few customers.

Still another company has organized trained personnel of both operating and commercial departments to man telephones and perform the routine of receiving and routing trouble calls. Other office groups act as information and expediting centers that:

A. Provide engineering advice and information.



History of the Big Blow

The Big Blow of Saturday, November 25, 1950, hit without advance weather forecast warning of the intensity and duration that was finally experienced. Viewed broadly the storm was part of a vast atmospheric disturbance which from November 24 to November 26 brought strong winds, rain squalls, and high tides Great Lakes district, and severe cold to the North Atlantic Coastal region, heavy snow to the Appalachians and to the Mississippi Valley and southeastern United States. From this larger point of view the whole storm was the worst that had ever been experienced over the eastern part of the country.

It began as a "deepening Carolina storm" that moved North during the early hours of Nov. 25 bringing easterly winds of 75 mph (gusts of 105 mph) with heavy rain from the Carolinas through Pennsylvania and into southern New York. Another low pressure center moved erratically in Ohio.

The cold sector of the storm covered Ohio, Pennsylvania, New Jersey, and southern New York. Snow storms affected Ohio and western Pennsylvania. Ice formations up to 3 in. diameter appeared on conductors in Central Pennsylvania near Altoona. Rainfall was 2.61 in. along the coast. Some seashore communities experienced unprecedented high tides up to 6.35 ft above normal high tide, due to a combination of wind and tidal conditions.

Most of the utilities' trouble was associated with trees and limbs taking out sections of distribution feeders and secondaries. Volume of trouble began slowly but increased throughout the day bringing with it a lessened system load. Generating stations, inland, experienced very little trouble but those near the coast had to contend with high water.

RADIO COMMUNICATION was used extensively for emergency service and instructions by dispatchers and operating superintendents to line foremen (left) in trucks. As a result, crews were dispatched and service was restored in a much shorter time

B. Prepare periodic reports on extent of damage, customer service interruption calls, feeder operations and progress of repair work, weather forecasts, etc.

C. Assist in arranging work on calls demanding special attention, making load and voltage tests, patrolling overhead lines, and providing many other services to relieve trouble forces as much as possible.

Emergency Communications . . . The value of mobile radio equipment was proved time and again. Last November it; (1) Enabled crews to restore service much more quickly; (2) increased the efficiency of crew dispatchers; (3) played a vital role where telephone circuits were out of service; (4) was a way to maintain contact between all districts and with field forces during the storm and throughout the restoration.

One serious case of trouble developed with the failure of leased lines interconnecting one utility's dispatching points with remotely located radio transmitter stations. To improve the reliability of the radio communication system, leased open-wire lines will be replaced by a radio link at several of the dispatching stations.

Early in the storm important telephone facilities were lost by another utility and it had to rely solely on its radio network. The result was a tendency to "jam" the one radio channel. As a result facilities are being expanded to cope with future emergencies such as this.

Congestion that existed on another radio system is being relieved by assigning separate frequencies to radios used by the underground and overhead divisions. Duplicate transmitters are being considered at important locations to assure continuous communication with field forces in future emergencies.

Wire communication facilities were encumbered about as much as radio. However telephone companies cooperated with the power companies and provided emergency telephones so operating departments would have private lines to use for work dispatching. Regular trunks were well loaded with customer calls.

System Operation . . . . For many companies the storm did not call attention to any deficiencies in system operation. Most difficulties experienced were in the extreme east and middle west sections of the area which was struck by this severe storm.

In the extreme east section:

A. Loss of system load was gradual throughout the day of the storm and presented no problem in handling system load or generation.

B. Loss of leased lines used for communication, supervisory control, and telemetering presented serious problems in handling of system operations.

C. Unusually high tides presented a threat to power plant operation since all generating stations are located on tidal waters. Tidewaters reached critical levels at all plants. However, since established emergency procedures were followed to combat these conditions, no serious flooding of equipment was experienced.

D. Numerous outages occurred on high-voltage transmission lines due to whipping of conductors brought about by high gusty winds. This trouble occurred on single and multi-circuit lines

STEEL TOWERS SUFFERED from formation of 3-in. diameter ice on conductors

ROAD CLEARING AND TREE TRIMMING were necessary operations prior to replacing distribution primaries and secondaries as well as street lighting circuits

both on wood-pole and steel-tower structures.

In the middle western section, system operation was affected seriously by a freezing rain. In a 600 sq mi area ice formation on lines and trees rendered inoperative 150 miles of transmission lines and involved in excess of 1,300 miles of distribution lines and secondaries.

Farthest west section had snow but did not report any operating difficulties. In southern section, nothing unusual was experienced.

Materials . . . . The storm found most stores departments with sufficient inventories of materials on hand to permit restoration to be started without delay. As shortage became imminent, emergency allotments of materials were made available by supplies.

In the sleet area there was not enough material carried in stores to meet the demand. Large quantities of material were shipped in a short time. Arrival of the material created considerable congestion at one storeroom.

Pole Line Design. . . . Storm experiences indicate that in general no substantial revision is needed in design or construction practices. Transmission lines of most systems survived fairly well. Distribution line breaks were the main "annoyance" because of exposure to trees.

Increased conductor spacing on distribution circuits is being studied. Where series street light wires were on the same crossarm with 2.4 or 4-kv circuits many conductor burn-downs occurred. This trouble was undoubtedly due to the wires whipping together as a result of 14-in. spacing.

No 4 wire is the smallest size used for any overhead line on one system. This practice was established by benefit of previous ice and wind storms and this storm justified the policy.

Another angle of investigation is the matter of pin breakage with a view to developing stronger wood pins or revising permissible standards of use of wood pins.

Multi-conductor rubber-braid service cables developed trouble in the crotch near the tie part at the pole and the house. A study is being made. However, excessive deterioration with age at this point is indicated.

Pole Line Guying . . . A summary may be made by quoting one company's report: "Our pole line guying practices proved to be adequate to withstand most of the extraordinary heavy strains imposed on them during this violent storm. No changes in our present practice are contemplated at this time."

Aerial Cable. . . . Some companies have no aerial cable while others with a few miles installed had a limited experience or no trouble. One company that has no aerial cable in service does not feel that the storm will affect the thinking with respect to it. Use of such cable, according to the report, might have eliminated some circuit interruptions but, on the other hand, the length of time required to repair cable failure is much greater than the repair of wire failures, so that the over-all effect on service restoration would not be much different.

Another company reported: "The fine performance of all aerial cable installations stood out sharply in contrast with the performance of our open-wire distribution and transmission lines. While most of our open-wire distribution and transmission lines were in trouble at some time or other, there were only three instances when aerial cables failed and these failures were due to large trees falling on the cables. There were many instances when the supporting poles were broken but the aerial cable continued in operation. In other instances, the cable messenger and cable supported large broken trees without interruption to service."

Still another company reported that it has about 110 miles of 13.8-kv lead-covered aerial cable, first of which was installed in 1925. Much of this type of cable is in suburban areas and the practice will be continued to use it for 13.8-kv construction between substations.

The same company also installed self-supporting aerial cable for some of the 4-kv feeders. Both the 4-kv and 13.8-kv feeders are run on public highways and many trees are encountered. The satisfactory experience during the November storm as well as previous storms re-emphasized the reliability of this type of construction to that company.

Tree Trimming. . . . Trees were responsible for a large portion of the damage to overhead lines. Falling trees were a result of the ground having been softened by excessive rainfall prior to and during the wind storm. Broken tree branches and dead wood tore down or caused burning of overhead conductors.

Three things stand out in the reports. Extensive tree trimming programs paid off well during the storm. When it had been neglected the im-

portance of more extensive tree trimming was emphatically demonstrated and tree trimming programs are being stepped up as has been usual after severe storm of this type.

Ice on Overhead Lines. . . . In general, east of the Susquehanna River the November storm was a wind storm only. But in central Pennsylvania ice formation on lines was about 3-in. diam and icicles were up to 12-in. long. Ice was about 1 in. thick on trees. In this section transmission and distribution conductors broke and towers toppled.

AERIAL CABLE provided continuous service in many installations, even though the messenger and cable supported broken poles and trees

Weather Forecasting. . . . A larger company's experience indicates that advance notice of a storm permits alerting the personnel involved so that it can start expanding the organization in anticipation of the storm. This also permits advance assignment of personnel to the various shifts for emergency service so they can get proper rest.

One company reported that last November's storm struck without warning but the severity of the storm was such that no effective preventative action could have been taken to mitigate its effects even if there had been advance notice.

Another eastern utility is investigating sources of weather information and trying to determine where the most accurate information can be secured.

Weather instruments have been installed by two utilities reporting. The one company has instruments in two generating stations. Additional instrument installations are being considered at five widely scattered locations throughout the territory to assure better storm intelligence.

Other Practices. . . . Various companies have taken the following steps:

1. Raised sump pump motors by extending their vertical drive shafts.

2. Installed barriers encircling the hotwell pumps and motors to keep flood waters from filling hotwell pits.

3. Revised the method of receiving telephone calls, permitting system operators to handle directly only calls from attended stations and a few special telephone lines.

4. Installed additional interdepartmental communicating equipment.

5. Worked with telephone company and revised the telephone facilities into the service buildings to afford better communication for customers.

6. Made arrangements to commandeer, if the situation demands, radio-equipped gas department cars.

7. Ordered an additional small ac generator to be used with floodlights, radio transmitter, or electrically operated tools.

8. Installed fuses for sectionalizing purposes in a vulnerable primary circuit.

9. Installed attachments to permit hand-operation of electrically operated gasoline pumps in garages.

10. Stocked a small amount of emergency repair equipment at a remote location on the system, although being a single-base operating company.

11. Provided an additional sump pump in a control pit at substation.

12. Elevated terminal blocks, control panel, and floor to avoid trouble by flooding in substation.

13. Confirmed wisdom of decentralization of dispatching.

14. Provided justification for additional portable FM radio-equipped trucks.

15. Provided more auxiliary lighting for repairs to lines during the night.

16. Divided territory into distinct districts for better operating efficiency, during major emergencies, each being self-sufficient, having own control center and mobile radio apparatus.

Other companies are considering the adoption of these steps:

1. Make better use of all company cars and "emergency" tool boxes.

2. Utilize the services of the engineering department personnel as patrolmen.

3. Use a high-wheeled vehicle or simulated amphibious car to travel flooded highways in low-level territory.

4. Clear pole-top position for sole occupancy of primary circuits and improve primary spacing. Remove small series street lighting conductors since they were the cause of primary circuit troubles. Convert lighting to multiple systems.

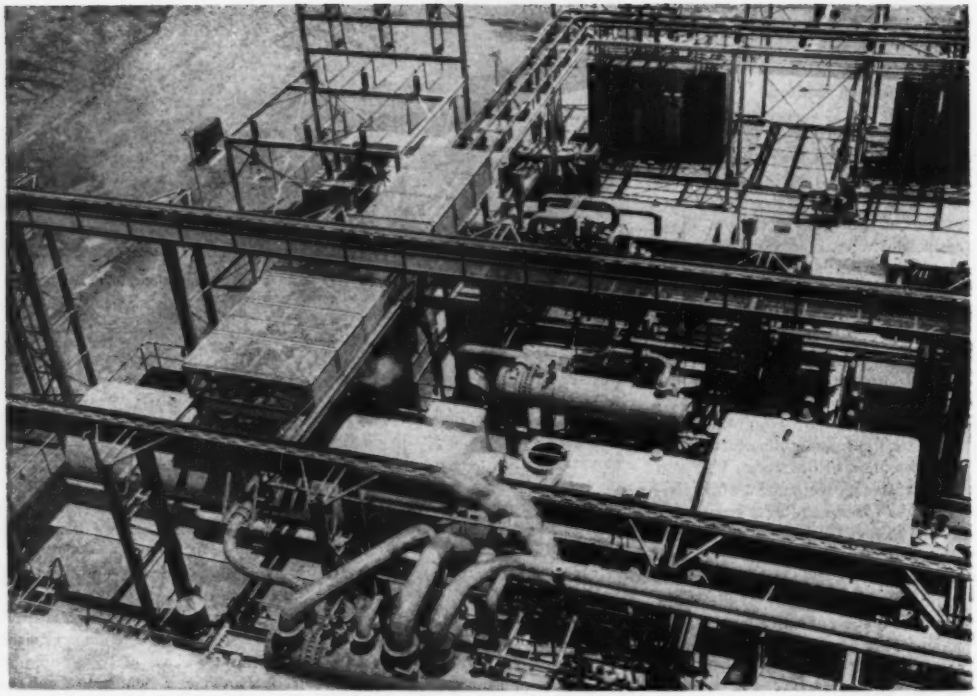
5. Have enough trained technical or commercial personnel acquainted sufficiently with the layout of facilities to act as efficient guides for the outside crews brought to the territory. However, this situation cannot be overcome because the utility cannot afford to build up its engineering staff far greater in number than normally needed just to have men available when needed in an extreme situation.

6. Use engine-generator sets for a limited electric supply should normal supply be interrupted at control center and district operating centers.

7. Plan a 2.5-kw, 3-ph, 180-cycle portable engine-generator unit with double outlet for operating a chain saw and two 1,000-watt lamps.

Following companies have contributed to the information given here:

Atlantic City Electric Co
Central Hudson Gas & Electric Corp
Consolidated Edison Co of New York, Inc
Consolidated Gas Electric Light and Power Co
Delaware Power & Light Co
Duquesne Light Co
Eastern Shore Public Service Co of Maryland
Jersey Central Power & Light Co
Long Island Lighting Co
Metropolitan Edison Co
New Jersey Power & Light Co
New York State Electric & Gas Corp
Niagara Mohawk Power Corp
Pennsylvania Electric Co
Pennsylvania Power & Light Co
Potomac Edison Co
Public Service Electric & Gas Co
Rockland Light & Power Co
West Penn Power Co



OUTDOOR TURBO-GENERATORS operate successfully. This 80,000-kw unit is a good example of such an installation

Problems In Outdoor Station Operation Can Be Solved

A company with 3 years experience in the operation of 10 outdoor turbines at 4 plants reports here the problems encountered and tells how they were solved

C. W. GEUE, Superintendent of Production
Texas Electric Service Co, Ft. Worth

After operating outdoor generating stations for three years under all kinds of conditions we are convinced that this type of plant is entirely practical from every standpoint. Successful operation depends not only on design of the plant but also on experience gained in operating the equipment. No major problems of outdoor station operation have been encountered that could not be satisfactorily worked out.

Preventive measures that have been incorporated in recent outdoor generating plant installations on the system of the Texas Electric Service Co have included: (1) Silencers for fans, exhaust stacks on boiler blow down tanks and safety valves; (2) reversible fans for blowing warm air out through iced-up cooling tower louvers; (3) rain hoods for splash-proof motors; (4) air driers for control air lines to do away with condensed moisture; and (5) the use of soil heating cable, under thermostatic control, as freeze protection on water and intermittent steam service lines of various types. How these and other similar measures were carried out is told here in detail.

Our first outdoor unit had a net capability of 45,000 kw at 15 psig hydrogen. Put in service in April, 1948, it is served by two 920 psig, 905F boilers, gas-fired, with oil as auxiliary fuel.

To date, this company has in operation a total of ten outdoor turbine installations in four plants, totalling

247,000-kw net capability. Smallest of these units has a net capability of 13,000 kw, operating at 600 psig and 825F. The largest unit has a net capability of 80,000 kw, operating at 850 psig and 900F. Another unit of 80,000-kw capability, operating at 1250 psig and 950F will go into operation next year, as will a 44,000-kw unit operating at 850 psig and 900F. All of these units have automatic combustion control.

Outdoor temperature has ranged from minus 2F to 100F with temperatures well below freezing for a week.

Cooling Tower . . . One of the first problems encountered was the blanketing of the louvres of the cooling tower with solid sheets of ice. This, of course, restricted the flow of air through the tower, resulting in high circulating water temperature.

Several solutions for this problem have been worked out. By shutting down the fans one at a time for approximately an hour each, individual cells were thawed out. This method is still practical. However, by removing the porcelain thimbles along the outer rows of holes in the deck of the tower, thus permitting heavier streams of water to fall, icing-over of the louvres is not so rapid. The most satisfactory solution to the problem has been incorporated in the design of the latest tower. Here, reversible fans were installed so that individual cells can be defrosted much more rapidly by reversing the fan, thus blowing warm air out through the louvres.

Noise Elimination . . . Our first outdoor unit was installed in a plant very close to a small residential area. The noise level of the outdoor plant unit was annoying to the neighbors. Noise came from various sources, the most objectionable coming from forced-draft fans, exhaust stacks on boiler blow-down tanks, vents on deaerating heaters, and noise due to natural gas flowing through the burner supply headers and regulating valves.

The noise level from the forced-draft fans was reduced from 111 decibels to 99 decibels by the rather simple expedient of enclosing the fan suction opening. This consisted of a sheet steel room with approximately 15 ft by 15 ft floor area by 10 ft high and lined inside with hair felt which was held in place by expanded metal lath. Air entered through an opening the shape of which was so arranged as to require the entering air to make a 180 deg turn. This opening also permitted entrance for routine examination of inlet vanes and bearings. The installation of this enclosure also solved the problem of inlet vanes and operating mechanism icing-over during times of freezing rain.

Later plants have used double suction fans and slower fan speeds and have obviated the necessity for a silencing chamber.

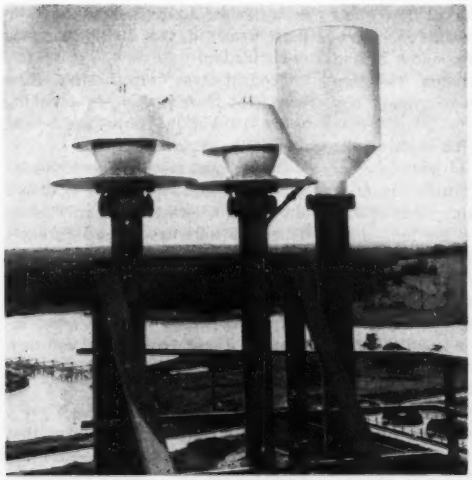
Noise from vents on heaters was solved by installing silencers on the vent piping.

The very annoying shrill noise from the boiler blow-down tank vent line was more or less accidentally solved by installing exhaust hoods on top of these lines to collect the condensation that was forming in these vertical lines and blowing over the plant equipment. This did not eliminate the noise completely but reduced it to a pitch that was not objectionable.

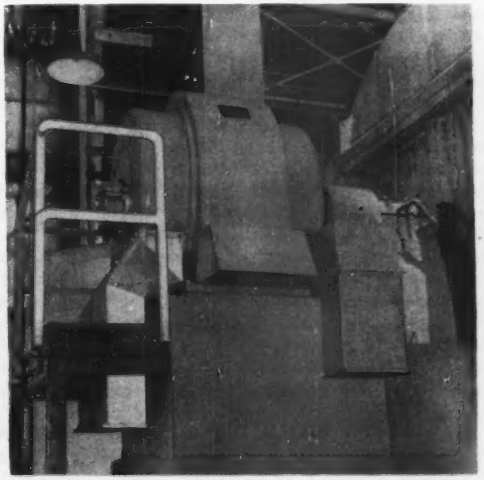
Pipe line noises due to high velocity gas were very materially reduced by wrapping the line with several layers of hair felt which was further covered to protect it from rain.

All safety valves are now being equipped with silencers.

Control Air . . . Station air compressors, instrument compressors, air piping, and controls on outdoor units are all outside. Experience during the first winter of operation of the first outdoor unit indicated the need for clean dry air in control lines and the control system. It is imperative that



SILENCERS ON SAFETY VALVE exhaust pipes and exhaust hood on boiler blow-down tank vent reduced noise which was objectionable at plant located near small residential community. FD fan noise was cut by enclosing suction opening



EXTENSIONS to inlet and discharge air ducts on induced draft fan motors eliminated coil failures that had apparently been caused by rain splashing on motor base pedestal and especially around air intake where water was swept up with incoming air

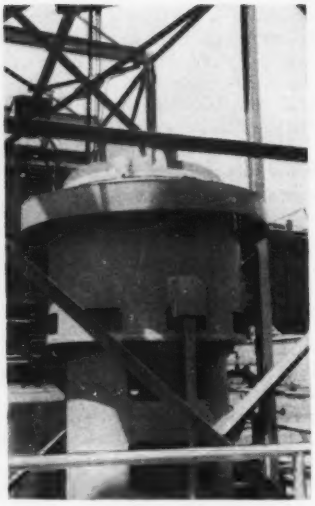
the compressed air be free from moisture at the lowest temperatures that are to be encountered. Otherwise, air lines and operating mechanism will freeze during cold weather and impede proper functioning of the station.

First driers for this purpose were shop-made, using activated alumina as the moisture absorbing agent. These have proved successful. However, on later installations factory-made driers have been incorporated into the design. These driers automatically change over to a re-activated drier while the one that has been in service is going through a drying-out period. Dryers purchased now give air with dew point of—40F.

Outdoor Motors . . . Conventional splash-proof motors required further protection from rain. Several coil failures could be attributed to heavy rains and although the motor itself was waterproof, rain splashing on the motor base or pedestal, especially around the air intake, was swept up with the incoming air into the motor. This problem was solved by attaching metal duct extensions to the air intake and discharge and extending these below the pedestal.

On vertical motors a metal hood was installed with vertical sides extending well below the air inlet ports to keep out driving rain. Sufficient area should be allowed between the vertical skirt and motor so as not to restrict the free flow of air to the motor.

Freeze Protection . . . Protection against freezing of air, water, oil, and intermittent steam service lines is essential to the continuous operation of outdoor power plants. Even such equipment as condensate lines, heaters, and boiler feed piping that would not freeze while in operation must be protected against freezing while the equipment is out of service. During the first hard freeze the steam tracer lines that were originally installed for freeze protection proved to be inadequate. Tracer lines froze due to improper drainage or venting and as a result many lines froze that were essential to plant operation, such as, control air lines to damper regulators, practically all piping to instruments in the control room, water level piping to the feedwater regulators, boiler feed-flow, and steam-flow meter piping to the control room and to the feedwater regulators.



METAL HOOD with vertical sides extending well below inlet air ports were installed on vertical motors to keep out driving rain which caused coil failures

During this period an operator was stationed in a tent at the drum level gage glass and he telephoned the drum level to the operator in the control room who could raise or lower the water level through remote manual operation. Control air lines to the damper regulators were quickly inspected for pockets or low spots and thawed out with a torch. Temperatures were as low as minus 2F and this method of operation was continued for several days without any plant shut-down.

Soil heating cable has replaced the steam tracer method of freeze protection. This cable is installed in 60-ft lengths having a heating value of 400 w at 110 v. Lengths are limited by the amount that can be operated satisfactorily within safe voltage limits. The highest voltage used in any plant for this purpose is 220 v. In order to eliminate burnouts in lengths shorter than 60 ft proper resistors are connected in series with the shorter length of cable or quite frequently the full-length can be continued on an adjacent pipe line. This method has proved very satisfactory.

On cold water lines, or lines operating at temperatures below that which would damage the covering and insulation of the heating cable, the cable is laid immediately against the pipe or equipment. Both the cable and equipment are then covered with metal foil to distribute the heat uniformly. Over this is applied the standard pipe covering or insulation which in turn is covered by a weatherproof metal cover.

On hot lines, or lines that may become hot, such as blow-down lines and water column drain lines, a layer of insulation is first applied to the equipment, then the heating cable and the further insulation and protective covering.

In many cases, small lines may be grouped together in a metal trough with one heating cable. Superheater drain lines, column drain lines, and others can also be grouped and brought to ground level in a metal enclosure with sufficient heating cable in the enclosure to keep the piping above freezing.

On heating cable installations all circuits terminate in a switchbox with snap switches on each group. The whole system is controlled by one or more thermostats which automatically turn on the system when the temperature drops to 34F.

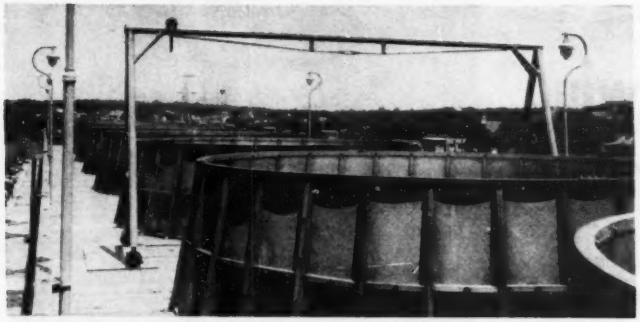
Recirculating hot water is another method of freeze protection that is being used to protect equipment such as piping and heaters on a unit that is shut down. This may be accomplished in several ways where steam is available from another unit to heat water in the idle system for re-circulation.

Pendant type superheaters have been kept from freezing by installing about 10 kw in lamps under and around the superheater.

On the latest installation which consists of an 825,000 lb per hr boiler and an 80,000-kw turbine, only minor difficulties were experienced during a week of sub-freezing weather with temperatures as low as 6F. Blow-off lines froze between the drums and valves which had not been insulated. These were thawed and then protected with heating cable.

Freeze Protection Precautions . . . There are several precautions that must be observed in freeze protection. Among these are:

1. Periodic inspection or testing of the various circuits to be certain they are in operating condition.



MAINTENANCE ON COOLING TOWER FANS and equipment was facilitated by construction of an A-frame. The use of reversible fans on cooling tower to blow warm air out through louvers solved ice problem on most recent installation

2. There are several types of heating cable. The insulation on one kind will stand a much higher temperature than the other. Lead covered cable may be used where maximum temperature is less than 160F; Teflon covered for maximum temperature of 500F or less. Either must be installed so that the temperatures of the equipment will not injure the insulation.

3. Where freeze protection is provided to water-legs on transmitters, such as drum water-level transmitters, if both water-legs are not heated equally the transmitter will transmit a false water-level and thus will give faulty feedwater regulator operation. Thus, it is very important to frequently compare the water-level as shown by the gage glass with the transmitted water-level as shown on the instrument board.

4. Leaks in the connections between the drum and water-level transmitter will give erroneous water-level indications. One serious leak caused the water-level indicator to show low water. The feedwater regulator was actuated from the same transmitter and opened although the actual drum level was normal. The high water alarm in the water column gave sufficient warning to prevent water from getting to the turbine.

Maintenance . . . Annual inspections of outdoor plants are scheduled as carefully as possible to avoid the extreme cold weather. When it is necessary to work on equipment in inclement weather, prefabricated shelters made of collapsible pipe frames and tarpaulins are erected over the equipment.

Portable or semi-portable A-frames permanently located on top of the cooling tower have saved their cost many times over in time saved to inspect or repair cooling tower fans and reduction gear drive. The same is true of portable A-frames to handle outdoor equipment that cannot be reached by the gantry crane.

Walkways, stairways, and operating decks present a hazard during periods of freezing rain or sleet. Temporary relief has been obtained by application of salt on walkways and by applying heat with weed-burners on metal grating. Probably some form of heating, such as electric-heating cables in conduit, imbedded in concrete walkways and stair-treads would keep these free from ice if the cost were justified.

Training Operators . . . Arrangements are made to have the plant superintendent, his assistant, and the electrical and mechanical foremen on the job site as soon as the erection and installation of equipment has been started.

Shift engineers and control room operators are generally men who have had a number of years experience in one of the older, low pressure plants, particularly experience in boiler and switchboard operation. These men are transferred temporarily to one of the outdoor plants where they are given from three to six months operating experience and then they are sent to the new plant approximately one month before the new plant is started up.

Whenever possible, young men are used on the new plants. They are very alert. With their previous training in the older plants they appreciate the various factors involved in operating boilers and turbogenerators and adapt themselves readily to the job of operating the plant from a central location.

Loud speaker communication system between the control room, firing aisle, and turbine is a very useful device and much more convenient and faster than the regular telephone intercom-system. Plans are being made to determine the advantages of using a walkie-talkie between the plant and water wells where communication is not normally provided.

The sound-powered telephone has also proved useful, especially in starting up a plant. It can be stretched out between any two points and does not require any source of power.

Switchgear . . . Outdoor auxiliary switchgear enclosed in metal cubicles must be dust-proof and rain-proof. After severe dust storms or sand storms these require somewhat more inspection and cleaning than is the case with indoor type plants. Pressurized cubicles, with the pressure slightly above atmospheric, are being considered as a possible solution to the problem of keeping dirt out of the switchgear.

Outdoor motors such as circulating pump motors, house service pump motors, and cooling tower fan motors are equipped with heaters to keep them dry during idle periods. The location of these motors makes them subject to sweating, should there be any sudden change in temperature when they are idle.

With outdoor forced-draft fans the air to the fans and air preheater is at outdoor temperatures. Under certain conditions this will cause corrosion of the cold end of the air preheaters. Corrosion has been experienced in one plant on preheaters that were not equipped with by-pass air ducts or hot air re-circulation systems. However, on an identical plant in another part of the system there has been no corrosion. Both are gas-fired, but the plant that had corrosion also burned large quantities of fuel oil during extreme cold weather. More recent plants are equipped with hot air re-circulation so that the temperature of the inlet air to the fan can be increased.

Conductors Swing Together

Full scale test shows that magnetic forces set up by fault currents and the switching of those currents bring conductors together and cause more conductor burndowns

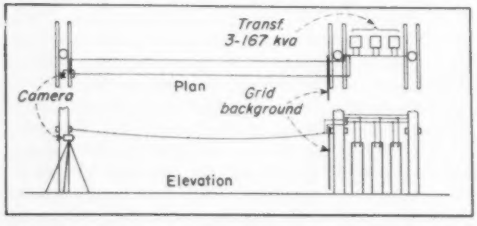
L. P. WORKS, Distribution Engineer
Wisconsin Public Service Corporation, Green Bay

A number of conductor burndowns on distribution circuits where the cause appeared to be obscure prompted Wisconsin Public Service Corp to investigate the problem. These studies sought to determine the action of conductors carrying fault currents in instances when the fault was established and cleared two or more times in rapid succession. Movies taken during the tests show violent conductor movements caused by magnetic forces set up under such conditions.

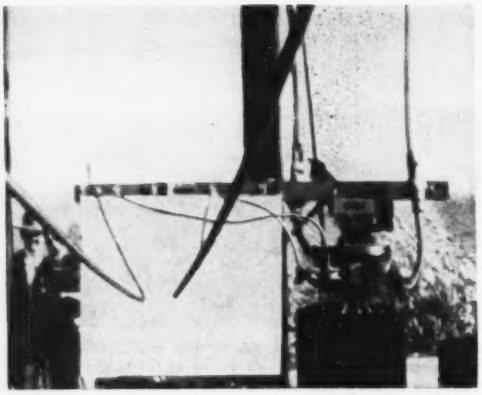
The problem studied may be encountered where circuits are equipped with automatic reclosing circuit breakers, repeater fuses, and oil circuit reclosers. It may even be encountered where manually closed circuit breakers are used.

Very small scale models were set up and used to demonstrate to linemen the violent movement of conductors carrying fault currents. These miniature scale model tests led to the staging of the full-scale tests recorded on movie film. In an initial series of tests at Oshkosh, Wisconsin, 500 ft of movies were taken. Later, at Green Bay, another series of tests was made and 2,500 ft of movies were taken.

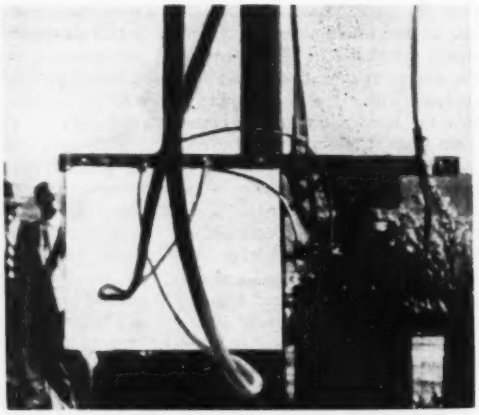
W. S. Peterson and H. J. McCracken Jr. of the Bureau of Power and Light, City of Los Angeles, reported on their extensive research work and findings in AIEE transactions in January, 1929. They found that for each physical arrangement of conductors there were six independent variables: Wire size, span length, sag, spacing, current, and duration of the fault. They also developed equations for the movement of copper conductors.



CAMERA SETUP for recording effect on conductors of a fault



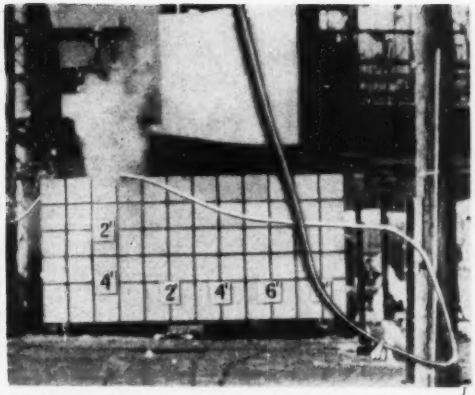
CONDUCTORS JUMPED TOGETHER when 6,000 amp fault was switched under delayed opening and fast reclosing sequence. Conductor was 4/0 WP on 100-ft span with 14½ in. sag



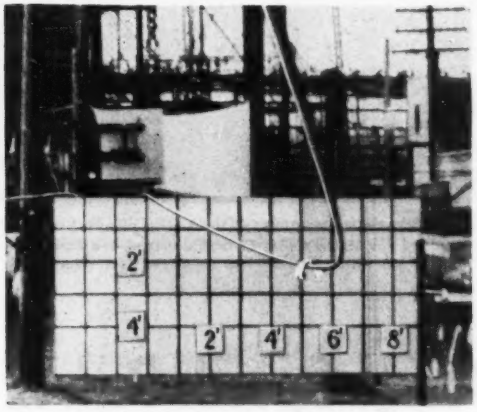
AN INSTANT LATER, the beginning of actual contact of conductors during the fault resulted in burndown. These views were taken during the first tests with movies at Oshkosh

Test Set Up . . . The movie camera was set up at one end of the test span, under one conductor. At the opposite end of the test span in the set up at Green Bay was a background with coordinates one foot apart. A marker was placed on the conductor at midspan. This marker, photographed against the background, permits an observer to judge quite accurately the movement of the conductor at midspan. Actual movement was only half of the apparent movement as read on the scale. Pictures were taken at a speed of 64 frames per sec. With projection at 16 frames per sec, the motion is slow enough to permit close observation of movement.

With fast automatic reclosing it was found: (1) That conductors were likely to swing close together at the instant the circuit is re-energized. (2) If the fault has been



VIOLENT MOVEMENT was also shown in tests at Green Bay where movie camera was set up under conductor on one pole, target with coordinates spaced one ft apart was at other pole



MARKER was placed on conductor at midspan for Green Bay tests to aid in observations. Due to projection from camera, to target, apparent movement was double actual movement

cleared it is only necessary to avoid contact or too close proximity. (3) If the fault has not been cleared, and the flow of fault current is re-established with the conductors very close together, the movement becomes extremely violent and unpredictable.

Assuming that the fault is cleared on the first breaker operation the safe amount of conductor movement is still limited because the maximum throw must be restricted to about one-half the conductor spacing, otherwise the conductors will swing together in midspan while energized. With considerable delay on reclosing, 15 sec or more, it is only necessary to prevent a faulted conductor at maximum throw from contacting an adjacent still conductor.

Calculate Successful Conditions . . . Substantial increase in short circuit currents which can be handled successfully with delayed reclosing is shown in the accompanying table. These values were calculated by using the formula developed by Peterson and McCracken in the earlier tests.

If the fault current at the substation bus is too high there are several steps which can be taken to reduce it before the overhead, open-wire circuits are reached. These include:

(a) Installation of current limiting reactors
(b) Reduction of span lengths
(c) Increasing conductor spacing
(d) Reducing conductor sags
(e) Use of aerial or underground cable or insulated open wire circuits to a point where the fault current will not exceed safe values
(f) Use of divided bus where substation design permits

Fault durations required for maximum throw for the conditions in the accompanying table range from 19 to 28 cycles. With sags found in practice, feeder circuits can be cleared in less than the time required for maximum throw. The value of the throw for shorter fault durations therefore becomes of interest and leads to consideration of another method of operation in which the fault is cleared very quickly, in not to exceed three cycles.

The fault may be suppressed by a short circuiting contactor which takes the fault current off the overhead circuit in two or three cycles. If this operation clears the initial fault, subsequent circuit breaker closing can be effected without incident. With short circuit currents customarily available on distribution circuits, the conductor movement with fault currents of such short duration would be insufficient to cause contact between energized conductors. Future developments in circuit breaker and relay design may bring comparable results. The oil circuit recloser developments point in that direction.

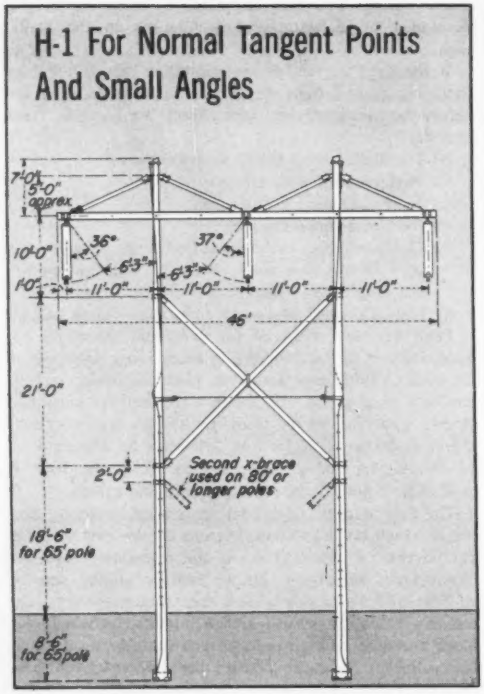
When these investigations were started it was hoped that a formula or guide could be developed by which it would be possible to determine quite accurately the limit of fault duration for different values of current and types of construction. Although this was not realized, it is believed, from the study of the movies, that the current values shown in columns 3 and 4 of the table can be used provided the maximum span does not exceed 150 ft and conductor spacing and tension are the same and that circuit breakers will clear the faults in 12 cycles.

Fault Current To Cause Contact Is Less With Delayed Reclosure

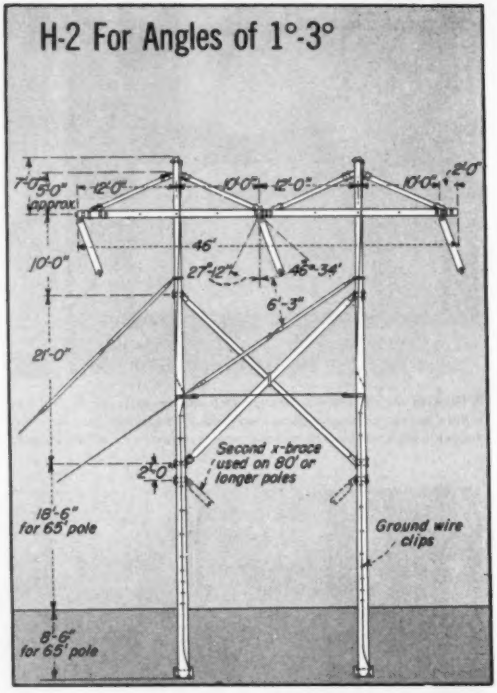
Data for 125 Ft Span, One Ft Sag

Conductor Spacing Maximum Throw	Fast Reclosing (1) 14.5 in. 7.25 in.	Fast Reclosing (1) 29 in. 14.5 in.	Delayed Reclosing (2) 14.5 in. 14.5 in.	Delayed Reclosing (2) 29 in. 30 in. (3)
Conductor	I_0 (4)	I_0 (4)	I_0 (4)	I_0 (4)
No. 2 Bare	1350	2670	2200	5200
No. 2/0 Bare	1920	4000	3100	7750
No. 2/0 WP	2190	4550	3600	8300
No. 4/0 WP	2720	5700	4500	9650

Notes:
(1) Fast reclosing denotes reclosure before conductors stop swinging.
(2) Delayed reclosing denotes reclosing delayed until conductors stop swinging.
(3) I_0 is the fault current which upon reclosure will cause midspan contact between two faulted conductors following the clearing of single-phase fault of duration sufficient to cause maximum throw for the values of current listed.
(4) I_0 is the current which will cause midspan contact between a faulted conductor and a clear conductor when fault duration is sufficient to cause maximum throw for the values of current listed.
(5) Spacing of pole pins on a standard six-pin crossarm.



H-1—TANGENT STRUCTURES are of two-pole design with poles and phases on 22-ft spacing. X-braces and knee braces provide rigidity. A second X-brace is used on 80-ft poles



H-2—FOR SMALL ANGLES, one to three degrees, the type H-2 structure was designed with 22-ft pole spacing and 22-ft phase spacing but with points of suspension one foot from normal

230-Kv Wood-Pole Design Speeds Power

Three utilities pool resources to build 136-mile transmission line of 200-Mw capacity. Wood pole structures chosen by panel of engineers to save critical steel and speed construction to AEC project. Design details described

D. P. AYERS, Assistant Head Electrical Engineer
Sverdrup & Parcel Inc, St. Louis

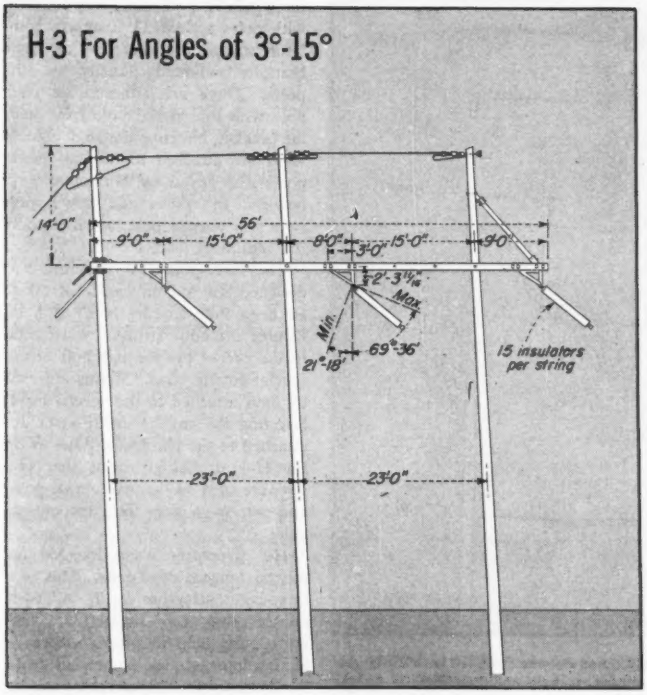
Recently an important defense project called for a large block of power in a hurry. About 200,000 kw of the total was needed before a steam plant could be built. Three private utilities pooled interests and built a 136-mi, 230-kv transmission line to meet the need. They are the Union Electric Co, Central Illinois Public Service Co, and Illinois Power Co. These are three of the five companies that formed Electric Energy Inc which is now building the 500,000-kw Joppa steam plant that will ultimately serve this load.

When the Joppa plant is finished the new 230-kv line will serve as a tie linking the systems of these companies and tieing the new plant into these systems.

Sverdrup & Parcel Inc are the consulting engineers for design and construction of the line.

To save critical materials and build the line in time allotted, a committee of engineers representing the three utilities and the consulting firm set up design criteria on which the plans and specifications for the transmission line were based.

General Design . . . To conserve steel and meet construction schedules, it was decided to use wood-pole structures for the line wherever topography and conditions in the surrounding area permitted. Wood-pole structures will be used on 95% of the line. Ex-



H-3—ANGLES OF 3 TO 15 DEG were taken on type H-3 structures having 56-ft double crossarms. Required clearances were maintained by using angle brackets. There are guys between poles and down guys on the outside pole at the top

To Vital Defense Project

ceptions will be six miles through a dense industrial area and several points where clearances require unusually high structures. This discussion will be limited to the wood-pole portion of the line.

Major design criteria for the line are enumerated in the accompanying table on this page.

Insulation Level . . . To attain relatively high electrical reliability, suspension insulator strings of fifteen 5¾ in. units were used. Minimum clearance between conductor and any grounded metal is held at 75 in. under conditions of extreme insulator swing. A wind pressure of 8 pounds per square foot on bare conductor was assumed for determining maximum conductor swing. Final design impulse levels based on a 1½ x 40-microsecond negative wave, are as follows:

	Suspension	Dead-end
Conductor-to-wood	1345 kv	1505 kv
Conductor-to-ground	1190 kv	1950 kv

The 1,190-kv value was calculated on basis of extreme insulator swing assuming air impulse value of 190 kv per ft.

Conductors and Shield Wires . . . Conductors are 954,000 circ mil, ACSR, 1.196 in. diameter. Comparison of effects of various maximum design tensions on span length, economy of construction, and other factors prompted selection of 12,000 lb maximum tension. Maximum conductor loading was assumed for design purposes as one-half inch ice, eight pound wind, at zero F.

There will be two overhead ground wires of ⅜ in., EHS steel strand, Bethanized C. They will provide an angle of protection for each conductor not greater than 35 deg. Maximum design tension for overhead ground wires is 4,915 lb.

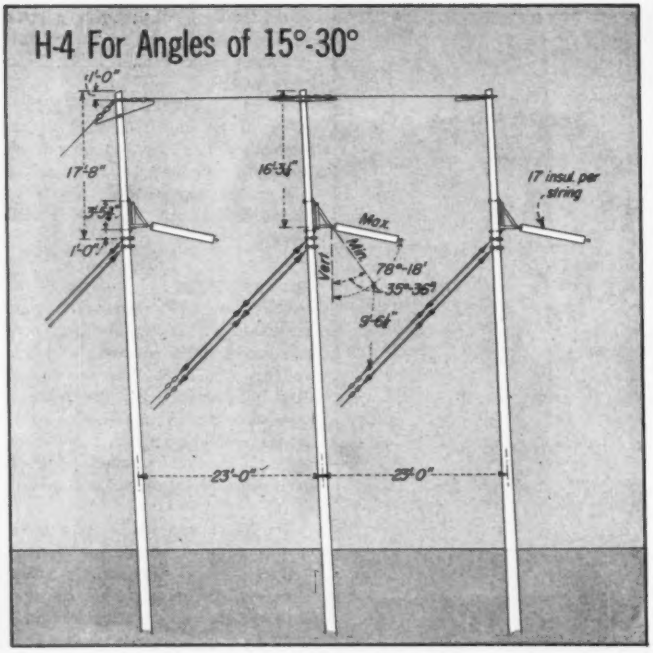
Structure Design . . . Analysis of the relatively few 230-kv wood-pole transmission lines in service in this country and similar lines operating at lower voltages influenced a decision to use 22-ft phase spacing and the structure types described in the following paragraphs. Minimum Class 2 poles are employed, and the minimum length of poles required for the spans chosen is 65 ft.

The prevailing pole market more or less dictated the use of Western Red Cedar and Douglas Fir poles. They were the most readily available in the length and class required and, at the time, delivery was needed. All poles will be full length Penta-treated to six pound retention in order to insure greater pole life.

Structures are strengthened, as re-

Design Specifications For Defense Plant Line

Type of Construction	Single-circuit wood-pole Braced H-frame
Design operating voltage	230 kv
Total Miles of Line	136.8
Level Ground Span	6 [illegible] ft
Maximum Span	1365 ft (Estimated)
Poles, Kind and Class	Western Red Cedar and Douglas Fir — Class 2 Min mum
Pole Treatment	Western Red Cedar and Douglas Fir, full Penta-treated to 6 lb. retention
Normal pole length	65 ft
Conductor phase separation	22 ft
Crossarm length, Minimum	46 ft
Maximum	64 ft
Minimum ground clearance	30 ft
Minimum clearance to wood of structure	6.0 ft
Loading Class	NESC, Heavy
Conductor	954 Mcm, ACSR
Overhead ground wires	2⅜ in. EHS steel, Bethanized C
Conductor tension (Max. design)	12,000 lb
Overhead ground wire tension (Max. design)	4,915 lb
Insulators	5¾ ft spacing, 15,000 lb shock resistant
Suspension insulator assemblies	Single string, 15 units
Angles and Deadend insulator assemblies	Single and double string, 17 units
Vibration prevention	Armor at suspension points, armor and Stockbridge dampers at deadend points



H-4—FOR 15 to 30 DEG angles the type H-4 structure was designed with 23-ft pole spacing and insulator strings attached to angle brackets mounted directly on the poles. There are guys on each pole and shield wires on the two inside poles

quired, by X-bracing and knee bracing, with assemblies and attachments designed in an effort to obtain maximum rigidity consistent with balanced economy.

Types of Structures . . . For normal tangent points and very small angle positions, up to one degree, type H-1 structures were designed. Pole and conductor spacing is 22 ft. X-braces and knee braces provide rigidity. A second X-brace is used where 80 ft or longer poles are required. Ground wires are carried down each pole to a pole plate fastened to the bottom of each pole. Ground wires are bonded together between poles just below the cross of the X-brace. Shield wires are installed so as to provide a 35-degree cone of protection to conductors. Minimum clearance from conductor to ground wire for the H-1 structure is 6 ft 3 in.

The H-2 structure was designed for use on small angles of one to three degrees. It is similar to the H-1 structure with the points of suspension spaced one foot from normal tangent spacing to allow for swing of conductors due to the angle. Because of the heavy design tensions, guys were provided on each pole of this type of structure, with attachment near the top of the X-brace. The same basic clearances that are provided on the H-1 structure are also maintained on the type H-2 structure.

For angles from 3 to 15 deg the type H-3 structure was used. This is a three-pole structure with a 56-ft double crossarm. Required clearances are maintained by the use of angle brackets. Guying is accomplished by horizontal guys between the poles and down guys attached at the top and at the point of crossarm attachment of the outside poles. The pole band is of special design to withstand heavy guying stresses. Additional support and rigidity is accomplished by the knee brace for the inside conductor. In order to maintain approximately uniform phase spacing, the pole spacing for the H-3 structure was established at 23 ft.

For angles from 15 to 30 deg the three-pole H-4 structure was designed with poles spaced 23 ft apart. Insulator strings are attached to angle brackets mounted directly on the poles. Guys are attached on each pole with the special pole band near the bracket, bisecting the angle. Shield wires are attached to the two inside poles and guyed by horizontal guys between the poles and down guys from the outside pole which support the additional load.

The three-pole H-5 structure was designed for use on angles of 30 to 60 deg. Pole spacing is 25 ft 6 in. Double insulator strings are attached to the eye of the through bolt of the special guying band. Strains are held by guys attached to the special band, bisecting the angle. Shield wires are attached to the two inside poles as on the H-4 structure, except that two guys are used on the two outside poles and two down guys from the outside pole.

H-6 structures were designed for use on tangent dead-ends. This is a three-pole structure with a 64-ft double cross arm. Jumpers are supported and held to proper clearance by insulator strings suspended from the cross arms. This structure can be used as a line deadend with full tension on both sides or as a deadend with full tension on one side and reduced tension on the other. The reduced tension installation is to be used in entering substations. The shield wires are either deadended, or passed straight on through, as required, on an auxiliary structure for this purpose. The structure is guyed on one or both sides as required. The auxiliary static wire structure is also guyed one or both ways as required by conditions in the field.

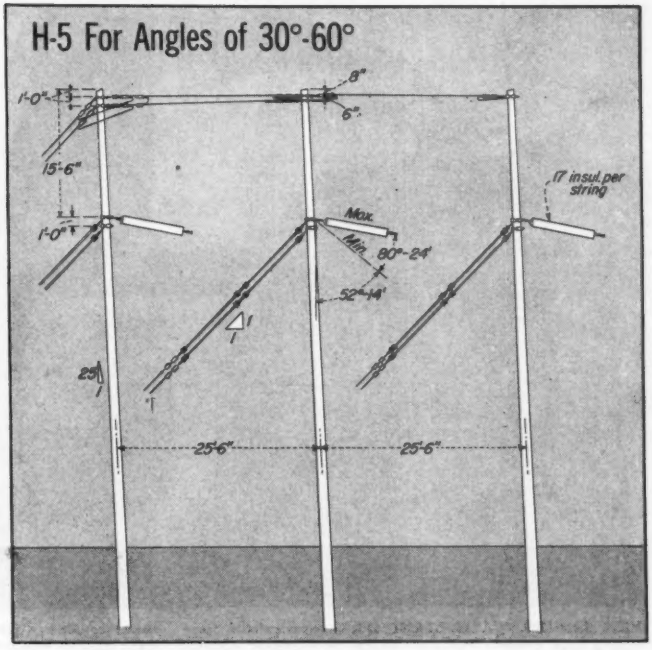
Special structures, as required, are essentially a variation of the basic structures which were used throughout in this particular 238-kv woodpole line

Laminated Crossarms . . . Limited supply of good sawed-timber crossarm material in the sizes and lengths required prompted a study of laminated wood members. This resulted in selection of West Coast Douglas Fir laminated wood crossarms, fabricated from six finished 2 in. x 4 in. units, No 1 or better grade. After fabrication, the laminated timbers were smooth-finished to dimensions of 9¾

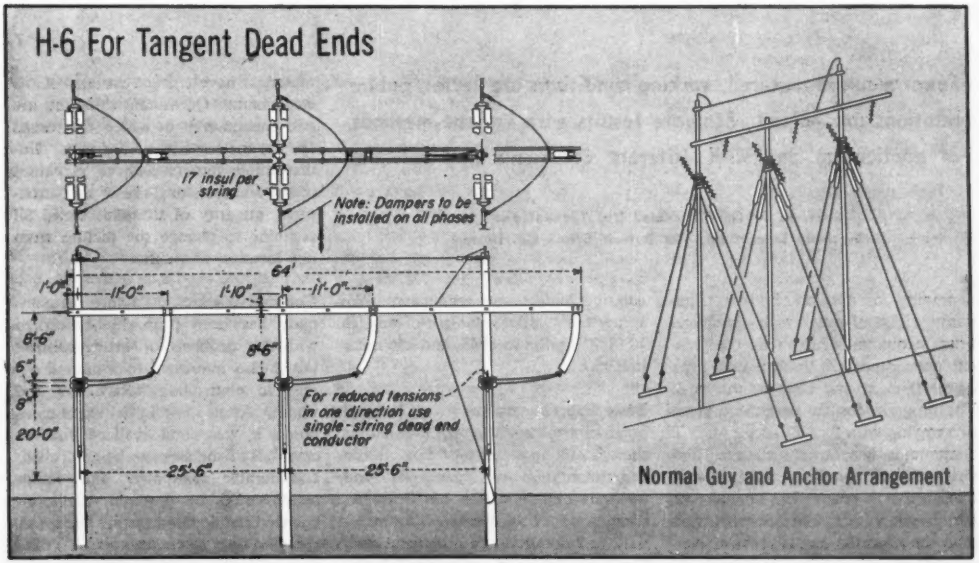
in. x 3¼ in., in lengths as required. Most cross arms are 46 ft long for tangent structures, with continuous lengths up to 64 ft for angle structures. All timbers, after being assembled, surfaced, and drilled as required, were hot oil treated for the full length with pentachlorophenol to a six pound retention. A resorcinol glue complying with Army-Navy specifications was used.

A series of electrical tests were made on a number of samples in high voltage test laboratories. Included were impulse flash-over tests (1½ x 40—microsecond positive wave), impulse with 60-cycle follow, 60 cycle alone and direct stroke. These tests indicated behavior quite similar in every respect to that of solid wood of like material and dimensions.

Acknowledgement is made of the contribution toward the design of this line by all participating engineers and specifically by **L. T. Byars**, *Electrical Engineer, Union Electric Co;* **T. N. Cofer**, *Overhead Systems Engineer, Central Illinois Public Service Co;* **G. L. England**, *Transmission Engineer, Illinois Power Co;* **R. H. Osborne** *and* **M. E. Pearson**, *Sverdrup & Parcel, Inc.*



H-5—FOR 30 TO 60-DEG angles the type H-5 three-pole structure was designed with 25 ft 6 in. spacing between poles. Double insulators are attached to the poles, guys attached to the special band bisect the angle, and shield wires are on the inside poles



H-6—FOR TANGENT DEAD ENDS the type H-6, three-pole structures were designed. Poles are spaced on 25 ft 6 in. centers and 64-ft double crossarms are used. Jumpers are held to proper clearance by insulators suspended from the cross arms

THREE ANNUAL WATER-BORNE SPRAY applications since clearing have brought this right-of-way to excellent maintenance condition. Compare with right-of-way at upper right, also cleared three years ago but abandoned since then

Right-of-Way Cleaning Costs Less

Fewer men are required, working conditions are better, public relations are helped. Evaluate results with various methods of application and with different chemicals and solvents

H. H. HAGERTY, Wood Use Technologist
Overhead Lines Dept, The Detroit Edison Co, Detroit

Spraying of Detroit Edison Company rights-of-way with chemical brush compounds has made the present appearance of transmission lines better than at any time in the past. The program for the past three years of spraying with 2, 4-D and 2, 4, 5-T compounds has largely changed the character of company rights-of-way from brush to grass. The annual cost of this program to date is much less than the prorated annual cost of cutting brush periodically. Welcome reductions in future tree trimming and clearing budgets are anticipated. We sprayed 67 miles of right-of-way in 1948, 253 miles in 1949, and 356 miles in 1950.

Bas'c Experimentation . . . Chemical brush control is still a new tool and as such is still in a state of flux. Basic experimentation on materials and methods of application has been accomplished. Improvements in materials and methods can be expected. Some of the early spraying did not give the results expected. Subsequent materials have corrected many of the early faults. Occasional situations are still encountered in which the results are not the same in similar plots. Undiscernible factors such as variations in soil and moisture, size of root structures, quantity of dormant seeds, all combine to change the picture from one location to another.

Contract Work . . . To date the company has been primarily concerned with the problem of brush control, but is also interested to a limited degree in controlling poison ivy and weeds. After some initial experimentation it was soon realized that to cover all of the areas to be controlled, considerable manpower and equipment would be required. This influenced the decision to turn the brush spraying over to contractors. To date this policy has been continued to the mutual satisfaction of the company

ABANDONED RIGHT-OF-WAY cleared in winter of 1947 same time as one at left, 100 yards away. Unused and unsprayed due to rerouting of line, average brush height has reached 14 ft

UNDER CONTROL NOW, this right-of-way, sprayed three successive years, now has a good ground cover of fern and grass

Brush Control In Brief As Detroit Edison Sees It . . .

1. Chemical control has proven its worth and will occupy an increasingly important place in this company's future operations. Such a program will naturally be reflected in lower tree trimming budgets.
2. Cost and manpower requirements of chemical control is a fraction of any other method of achieving the goal of a clear right of way.
3. The low level control achieved makes for better personnel relations as working and patrolling conditions are greatly improved. It also improves public relations.
4. Treatment of freshly produced stumps is highly desirable and advantageous.
5. Two or three overall water borne spray applications are required to convert a right of way to maintenance condition.
6. Low level control can be maintained at a minimum of expense and effort.
7. Poison ivy can be kept under control.

With Modern Chemicals

and the contractors. In some cases The Detroit Edison Co has furnished the materials and in others the contractor supplied his own. By either scheme the company feels that the contractors have given honest measure of performance.

Methods Used . . . Methods used by the contractors have been varied. The company welcomed this variation of approach to the problem. Following is a list of the methods employed.

1. Dow Brush Killer in water applied by power spray.
2. Dow Brush Killer in water applied by knapsack spray.
3. Ammate in water applied by power spray.
4. Esters of 2, 4-D and 2, 4, 5-T in fuel oil applied by power spray.

As the spray program progressed it became evident that some of the early hopes and claims made for 2, 4-D were a little over-optimistic, and that the spraying would have to be repeated for several years before satisfactory control could be claimed. The Detroit Edison Co agrees with other more experienced users that a right-of-way is converted to a maintenance condition when chemical control has reduced the woody plant population to a suitably low limit. Maintenance spraying then means a spot spray application to control the isolated brush when it reaches suitable height.

Evaluation Difficult . . . Evaluation of chemical brush control effectiveness is very difficult because of the many variables involved. At least three phases should be considered in passing judgment.

1. Percentage of live brush remaining of the original population. This requires a rather complete appraisal of the situation prior to spraying.
2. Height of the remaining live brush as a measure of the level or degree of control achieved.
3. Amount of terminal growth or resprouting subsequent to spraying.

When evaluating a spray program it must be remembered that certain factors will greatly affect the result. The height, density, and species of brush varies from mile to mile along and between individual rights-of-way. The terrain and growing conditions are different. The accessibility of the right-of-way and the availability of water must be considered.

It has been found very difficult to select similar test plots for checking the effectiveness and the cost of chemical control. These tests do give some of the answers but it must be remembered that they are rough comparisons because of the variables mentioned. For comparative purposes on The Detroit Edison Co system it is felt that a cost per mile of right-of-way is a good measure. Allowance has to be made for the different widths involved. Using the mile as a unit of comparison at least some of the variables are averaged out.

ANNUAL SPRAYINGS have converted this right-of-way with high population of brush four to six feet high only four years ago. Dead canes of the last of the more resistant species to be killed can be noted in the photo

Water Versus Oil Mixtures . . . Both water and oil mixtures of Brush Killer have been used as an overall foliage spray application. The water mixture is preferred. There are two reasons for this preference, economy and permanence of kill. After two applications of overall sprays of water and Brush Killer the percentage of kill on brush is in the range of 60% to 90%.

Costs Less . . . Based on The Detroit Edison Co's experience the following observations are made:

On tower lines it has been estimated that it would cost $200 to $300 annually per mile for a clear right-of-way by ordinary brushing methods. This is a prorata cost because hand brushing is usually done in five to ten year cycles, with its attendant brush problem getting increasingly worse until the end of the cycle is reached. On those rights-of-way which have not yet reached the maintenance stage the annual chemical control cost is $75 to $100 per mile and it is estimated annual maintenance spraying will cost $40 to $50 per mile.

Looks Better . . . At no time during the past hand cutting and clearance era has the appearance been as good as now after three years of spraying. In this respect the utility must decide on what is meant by clear right-of-way. That is, some want control at a low or grass level, while others do not mind brush several feet high. Also there is a difference of opinion as to the allowable number of woody plants and the maximum height tolerated. It has been this company's experience that once the brush cover has been removed the native grass grows luxuriantly. A dense mat of grass tends to suppress further weed and brush invasion.

Reach Maintenance Category . . . It appears now after three successive years of spraying that the rights-of-way so sprayed have been converted to the maintenance category. The number of successive annual spray applications required to convert a right-of-way will vary depending on the conditions, namely density, height, and species, found at the start of spray program. The Detroit Edison Co has not yet been able to determine, on its rights-of-way, the extent of deviation possible from an annual routine for the maintenance or spot spraying program. After a field check it was decided that several rights-of-way could safely be skipped this year. Here again growth conditions affecting the germination of old seeds and wind-borne seeds will have considerable influence on the reoccurence of the brush problem.

Control Stump Regrowth . . . Attendant to and a part of the brush control problem is the question of stump regrowth or sprouting on newly produced rights-of-way. The Detroit Edison Co has adopted the policy of spraying stumps at the time they are produced with a 3% to 4% solution of Esteron 2, 4, 5-T in fuel oil. The entire exposed bark, exposed roots and cambium ring are given a thorough wetting. It has been found that one man of a clearance crew, equipped with a knapsack spray tank, can treat in a few minutes all of the stumps produced by the entire crew in a day's operation. The spray application can be put on for so little cost that it is considered uneconomical not to do it. It is estimated that a stump treatment is equivalent to at least one foliage application at a later date. Experience has also shown that the control achieved is such that it would warrant spending much more to obtain the same results. For example it has cost from $10 to $30 per acre to treat the stumps on a newly cut right-of-way.

At the present time it is believed that after a new right-of-way is stump-sprayed it should be allowed to go through one growing season before a foliage application be applied. This is done to allow sufficient foliage to develop which in turn will absorb more of the 2, 4-D and 2, 4, 5-T acid at the time of subsequent foliage spray. In addition one growing season will allow seedlings to develop sufficiently to be seen and sprayed.

Basal Bark Spray . . . Recently an elaboration of the stump treatment, namely basal bark treatment of brush, has been given a limited trial. Excellent results have been obtained even on those species which are resistant to foliage sprays. This type of application, using the same mixture as the stump spray, is applied to the bark all around the trunk to a height of one to two feet above ground. Complete circling of the trunk is very necessary or erratic results will be obtained.

While this method appears to be too costly for an overall program it has possibilities as a supplement to a water-borne foliage spray. For example at the end of the growing season those isolated cases that have resisted the foliage spray can be given an additional treatment. Often during the growing season certain areas which cannot be sprayed, because of nearby susceptible crops, or for other reasons, can then be treated during the dormant season. This would make it possible to keep spraying personnel occupied the year round.

Stadium Lighting Installation—Pole base mechanism permits 3-ganged cutouts to be switched from ground.

Combine fuse protection with "disconnect-under-load"

Low-cost G-E oil fuse cutouts give you both

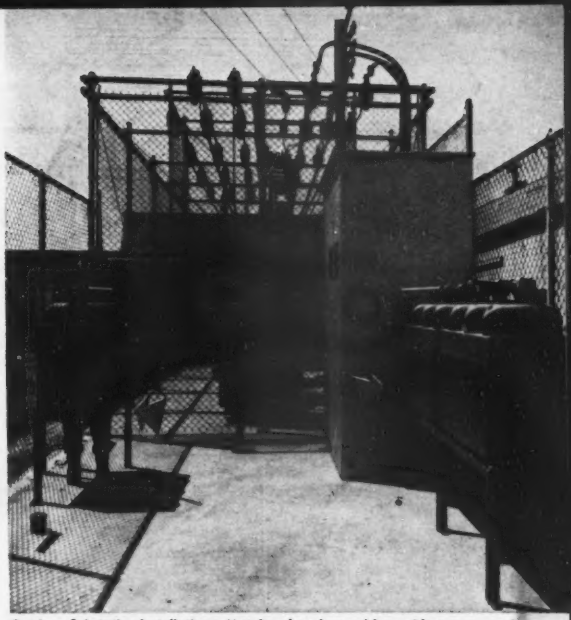
In the G-E oil fuse cutout all arcing occurs under oil when the fuse blows or when switched. The housing, with its drawn steel tank threaded into cast-iron cover, is liberally designed for safety; withstanding internal pressures well in excess of those that can occur at the cutout's interrupting rating. There are no exposed live parts—whether the cutout is in open or closed position—and no expulsion of arc flame.

Special arcing surfaces on the heavy self-aligning contacts keep load-carrying surfaces clean—make it possible to use these cutouts repeatedly as switches to open circuits under loads.

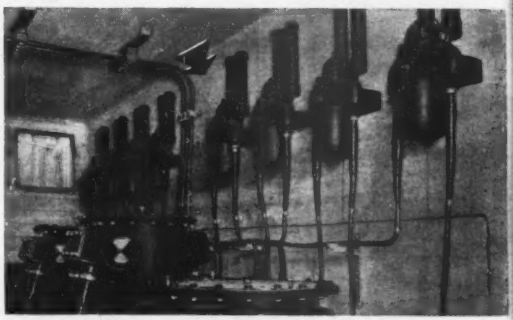
Suitable for both utility and industrial applications, these cutouts are—

1. **Available for 2400-, 4160-, and 7200-volt circuits, current ratings up to 300 amperes; interrupting ratings up to 11,000 amperes.**
2. **Ideal for indoor mounting, vault or subway mounting and outdoor pole or wall mounting.**
3. **Available in metal enclosed assemblies, single or three-phase, rack or wall mounted, and providing for cable, conduit, or pothead connections.**
4. **Provided with switching mechanisms for single- or three-phase switching and pole base operation on rack-mounted or metal-enclosed units.**

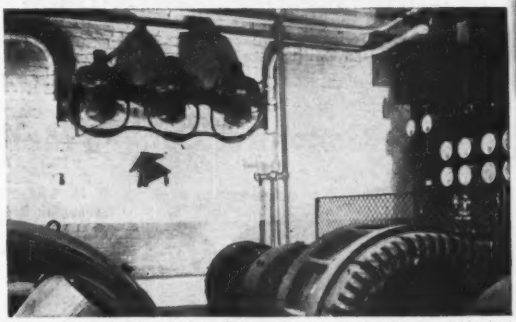
Full information can be found in Bulletin GEA-732—available through your G-E Apparatus Office, or by writing, *General Electric Company, Schenectady 5, New York.*



Outdoor Substation Installation—Metal enclosed assembly avoids exposure of cable entrances and gang-operated mechanism provides for simultaneous switching.



Subway Installation—Expansion chambers attached to cutouts permit complete submersion.



Indoor Substation Installation—Oil cutouts in incoming lines provide high current fusing.

406-40

GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

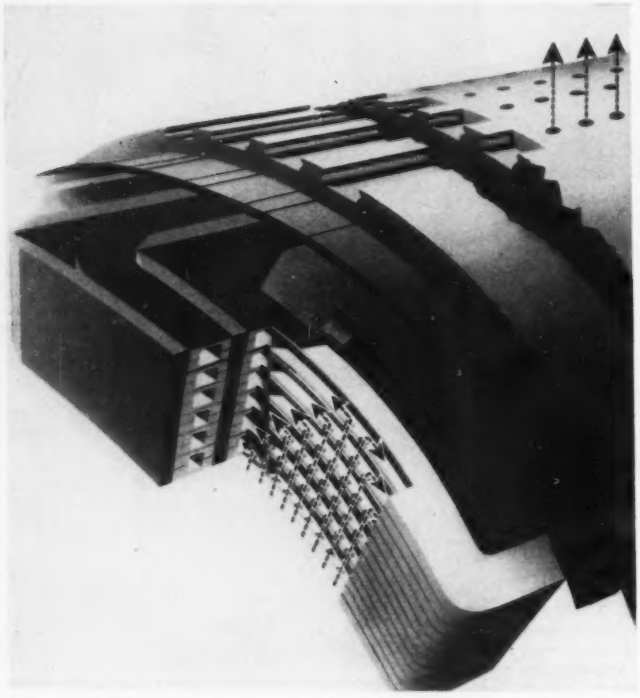


FIG 1—SECTION VIEW of rotor and rotor winding showing path of hydrogen gas flowing through rotor conductors for a particular type of construction. Creepage paths of conductors at central discharge sections are of same magnitude as for end turns of present-day hydrogen-cooled generators

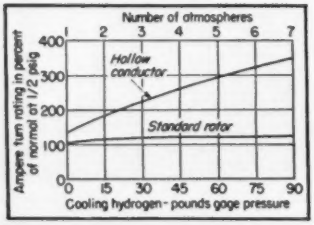


FIG 2—HYDROGEN PRESSURE effect on ampere turn rating for hollow conductor and standard rotor from tests on a full-size stationary model. Note extremely high increase for the higher gas pressures with hollow conductors

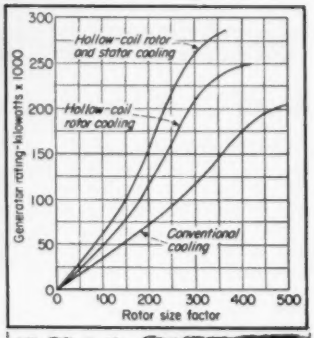


FIG 3—COOLING CURVES show how internal cooling will affect generator rating. Kilowatt ratings are based on 0.85 pf, 0.8 scr, and 30 psig hydrogen

New Generator Cooling Method Ups Rating by One Half

C. M. LAFFOON, Manager
Generator Engineering Dept
Westinghouse Electric Corp
E. Pittsburgh, Pa.

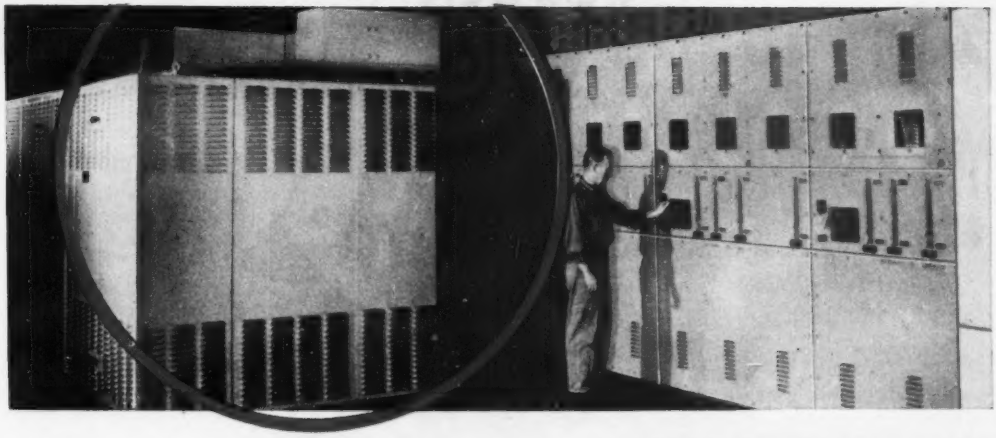
A new method of cooling large turbine generators developed by the Westinghouse Electric Corporation now makes it possible to increase machine ratings by as much as one half. The new technique consists simply of blowing hydrogen gas at high velocity through specially-constructed hollow generator rotor coils. This brings the hydrogen, the cooling medium, in direct contact with the copper.

Since this cooling method reduces to almost zero the heat flow through coil insulation, temperature of copper coils is determined by the temperature of the hydrogen gas, and the heat transfer coefficient from the copper to the hydrogen. Therefore, for a given maximum temperature rise, it is possible to pass more current through the copper coils.

Internal cooling is particularly applicable to units for ratings of 90,000 kw and above. The improved cooling makes possible the construction of ratings much larger than now possible with conventional hydrogen cooling. Ratings of 3600-rpm single-unit generators of 250,000 to 275,000 kw now appear possible at power factors and stability characteristics suitable for the large electric utility systems.

The increase in copper losses due to higher current densities is more than offset by the reduction in bearing losses resulting from the smaller bear-

(*Continued on page 138*)



G-E metal-enclosed reactors match modern G-E metal-clad switchgear in appearance—are usually built of special nonmagnetic steels or with panels divided into insulated sections, to hold down circulating current and keep losses and heating to the minimum.

Install your reactors adjacent to your switchgear

Metal enclosures, with their increased safety and good appearance, make this practical—save space and shorten bus runs.

With modern, good-looking metal enclosures, reactors can now often be installed alongside or as part of metal-clad switchgear. Savings in metal-enclosed buses, in space, and perhaps even in the cost of running buses to another floor for the reactors may well pay for the enclosures. In addition to increased safety to personnel, you also protect the reactors from external damage and limit the magnetic field.

General Electric metal-enclosed reactors can be built to match your switchgear. Housings are so designed as to keep down circulating current, losses and heating. G-E reactors themselves are of time-proved, one-piece, cast-in-concrete design—with such recently announced improvements as glass insulation and continually transposed conductors.

For full information on G-E cast-in-concrete reactors and their applications, and on metal enclosures, get in touch with the nearest G-E Apparatus Sales Office. *General Electric Company, Schenectady 5, New York.*

Among the extras that you'll find in G-E metal enclosures for reactors are these built-in supports for the leads.

401-94

GENERAL ELECTRIC

A new 500-kva, General Electric network unit is lowered into its vault on North Pennsylvania Street, Indianapolis by an Indianapolis Power & Light Company crew.

Load grows in Indianapolis
...and a new G-E Network Unit goes in

It's as simple as that with a secondary network. There is little rearrangement of secondaries or service entrances with this modern distribution system.

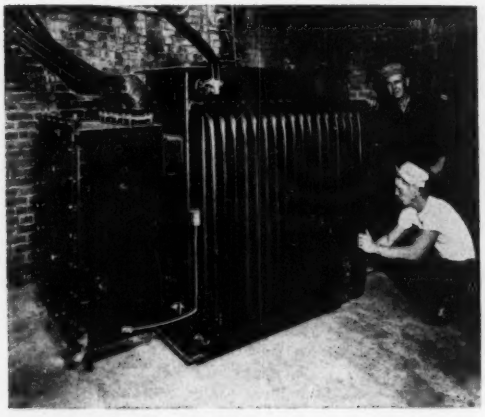
Better continuity of service is one big advantage of a secondary network. But, equally important to the utility is the elimination of headaches—and saving of rearrangement costs—as loads grow. Once a network system is installed, load growth can be taken care of by adding network units—*with seldom any other change or rearrangement required.*

This has been demonstrated in every city having such a system. Take Indianapolis, for example: Load increased greatly in the area around the post office on North Pennsylvania Street—modernization of stores, a new bank, and in general a healthy expansion of this business section.

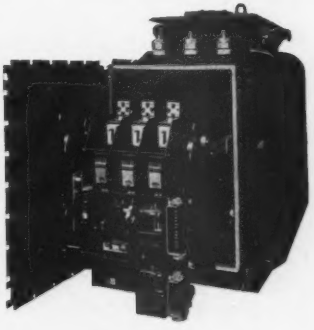
To serve this new load, the Indianapolis Power & Light Co. built a new vault and installed one 500-kva General Electric network unit.

The high-voltage feeder was already in the area—operating at 13,200 volts, it had plenty of capacity for the new load. The secondary was already in place . . . and with an established network system, the new unit was connected to this feeder and tapped in to reinforce the existing secondary grid. No redistribution of load was required, no rearrangement of service drops from one bank to another.

In every respect, with a network system, each added transformer represents an orderly step in system growth that was all provided for when the network was first engineered. For more information write for GEA-5024 and GEA-2017, *General Electric Company, Schenectady 5, New York.*



IN PLACE IN THE VAULT. This is the same unit shown on the opposite page after it was placed in the vault, and after cable connections were made. To the left is the throat-mounted General Electric network protector; at the right is the three-position disconnecting and grounding switch on the high-voltage side of the transformer.



G-E NETWORK PROTECTORS ARE EASY TO INSPECT . . . EASY TO MAINTAIN. Automatic system protection on a network transformer is provided by the network protector which trips on reversal of power. When conditions are corrected, it recloses automatically. Protector case is submersible. With the door open, the protector unit can be slid out on rails for ready inspection. Dust-tight relays are of the plug-in type—can be easily removed for checking and replaced with spares.

GENERAL ELECTRIC

402-312

Generator Cooling

(*Continued from page 134*)

ings required for the smaller rotors, and the reduction in rotor surface losses resulting from the appreciable increase in the radial length of the air gap and the decrease in rotor surface.

Under present conditions, the reduction in physical size of generating units for a given rating is of paramount importance since it results in the conservation of copper and steel. Higher costs per unit weight offset any possible cost savings resulting from the use of smaller amounts of copper and steel. Large capacity turbine generator units of this type, even at present costs, however, should result in lower overall station capital and operating costs.

The cut-away view of a rotor and rotor winding (Fig 1) shows the path of the hydrogen gas flowing through the rotor conductors for a particular type of construction. Curves at Fig 2 show the rotor ampere conductors per slot, when the average and maximum copper temperatures are held the same for the two types of construction. The lower curve is for the conventional rotor design, in which hydrogen gas comes in contact with only the outer surface of the generator coils, and shows that further increase in hydrogen pressure will offer very little increase of rotor ampere conductors. On the other hand, the benefit with internal cooling is tremendously higher. The increase is high for the higher gas pressures.

The above has applied only to rotor cooling. At present, the development of the inner-cooled stator coil has not been carried to the same stage as for the rotor, and it may be advisable to apply internal cooling in two steps—the first for the rotor alone, and the second for the stator. The curves of Fig 3 show what can be expected of internally-cooled rotor windings, rotor and stator windings and conventional designs.

The development of internal cooling with high-pressure hydrogen gas is claimed to open up a new era in the design and construction of turbin generators without too great a departure from present practice and experience. Two generators with internally-cooled rotors and rated 175,000 and 200,000-kw are to be completed in 1954, and a 90,000-kw 3600-rpm unit with both rotor and stator internally-cooled is now being designed and is expected to be available for testing late in 1952.

Seeded Transmission Right-of-Way Saves $3,000

CULTIVATED RIGHT-OF-WAY eliminates need for regular spraying and clearing of land. Program makes better use of land and improves relations with farmers

LYMAN H. HAMMOND
Farm Service Dept
N. Y. State Electric & Gas Corp
Binghamton

A cooperative program for clearing and seeding land on existing transmission line right-of-way in rural areas has provided joint benefits for New York State Electric & Gas Corp and farmers whose properties adjoin the right-of-way. In the fall of 1949 about 200 acres of land were cleared along the Westover - Lapeer transmission line. Of these 40 were limed, fertilized, and seeded the following spring. The net saving to the company from the elimination of chemical spraying in 1951 and the next few years is estimated to be $3,000. In addition, value of the program to agriculture by its educational effect, farmer relations and direct benefit to the individual farmer is considerable.

In the clearing and disking program, the company uses a 17-ton bulldozer, equipped with a 12-ft blade and pulling two gangs of harrows with sharpened 28-in. steel disks. The unit effectively clears heavy growths of brush and trees. Brush and saplings up to 2½-in. in diameter are ground up and left in the ground by the sharp disks.

Under the cooperative part of the plan the company offers to buy seed at about $10 an acre for farmers who agree to cultivate land which is cleared and disked along right-of-way on their property. If the land is suitable for a crop other than pasture or hay, similar payments are made, provided the farmers agree to keep it under cultivation for at least three years.

As a result of a meeting of farmers, company representatives, and agricultural agents, 16 farmers finally accepted the offer and seeded the 40 acres. However, because the width of right-of-way varies from 100 to 200 ft, this land was more desirable to the farmer for pasture or meadow than it otherwise might have been along a narrower strip.

Seeding offers no doubt will be made to other farmers throughout the company's rural areas as rights-of-way are cleared and local conditions warrant such an arrangement.

For Outlying Areas using multiple circuits

Standard glass meter cover provides seal and protection from physical damage and weather, dirt, and insects.
Photoelectric element plugs into luminaire—operates between 1 and 6 foot-candles, is unaffected by line-voltage variations between 105 and 130 volts.
Socket in top of luminaire permits replacement of control unit without tools—eliminates the need for orienting control unit when making replacement.

Photoelectric Luminaire Form 110

The Form 110 luminaire is the simplest way of controlling street lighting from multiple circuits. It is especially suitable for isolated installations beyond the reach of existing street-lighting circuits. Safety and adequate lighting are thereby provided where more extensive facilities could not be justified.

In the General Electric Form 110 luminaire, you have one compact, easy-to-install, easy-to-maintain unit. The Form 110 luminaire is operated by a photoelectric relay containing a sensitive phototube, two amplifier tubes for high amplification, and a tough load relay. All elements of this unit operate well below rated values for extra-long service.

After power failure the G-E Form 110 luminaire continues to operate the way you set it—and it's good for years of operation without adjustments. If it should fail, the control unit turns the luminaire ON, not OFF.

For a new idea in savings, look into the G-E Form 110 luminaire. Contact your nearest G-E office, or write for Bulletin GEC-395, General Electric Co., Schenectady 5, N. Y.

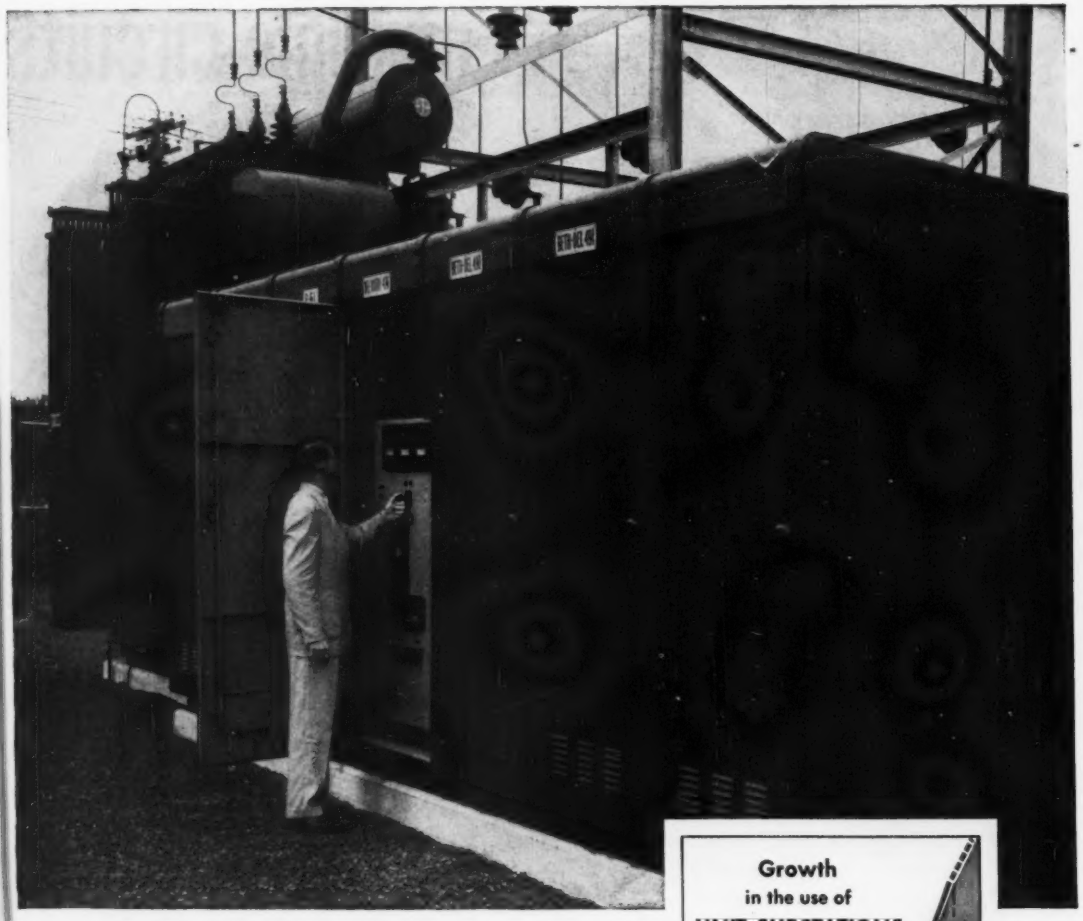
Type P Photoelectric Control for pole or cross-arm mounting.

Reflector support for Types CR or CS optical assemblies is die-cast aluminum, clamped to lugs on the hood.

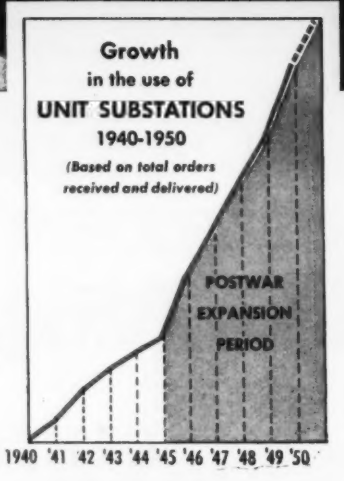
GENERAL ELECTRIC

452-115

Niagara Mohawk EXPANDS FAST at



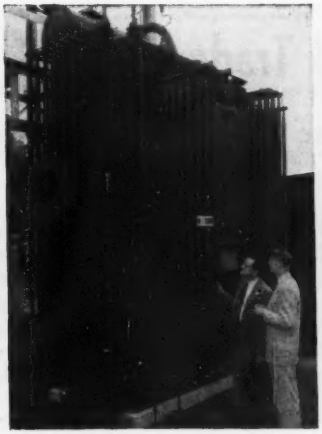
NIAGARA MOHAWK ADDS 10,000 quickly and easily with third and fourth G-E master unit substations (5000 kva each). The one above transforms 33 kv to 5.04 kv. Open compartment door shows operating panel for magne-blast breaker. More details in photos on opposite page.



WHAT DOES THIS TREND MEAN? Savings in time, money and materials are becoming more and more important. It also means that adaptable compact unit substations have proved to be perfectly suited in cases where "special designs" were thought necessary. You get plenty of flexibility when you use G-E packaged substations.

low cost—with G-E Unit Substations

CIRCUIT BREAKERS are safely and easily removed for inspection. This view shows rear of Niagara Mohawk's new G-E metal-clad transformer main breaker in operating position. Breaker cannot be lowered for removal until it is tripped and power circuit interrupted.



YEARS OF MAINTENANCE-FREE SERVICE ahead for transformers in Niagara Mohawk's new unit substation. Bus regulation of voltage is provided by load-ratio-control equipment. Experience shows G-E LRC equipment requires very little maintenance.

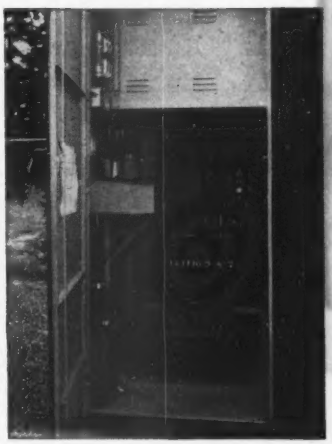
FORESIGHT PAYS OFF again and again. Above is section of older G-E master unit substation installed by Niagara Mohawk in 1939. Growing loads posed no problem—new unit (barely visible, upper left) installed alongside, capacity increased by 5000 kva.

Quick, easy ordering and installation help Niagara Mohawk expand fast to meet increased demand in Albany area

Like many other utilities and industrial plants, Niagara Mohawk Power Corp. has shown it pays to use "packaged" power equipment. In this locality, they've chosen a standard distribution system (in this case: primary network) and a standard load increment, or "building block" of power (5000-kva). As load grows, a duplicate substation of this capacity is tied into the system, always a jump ahead of demand.

A G-E unit substation arrives ready for use—you simply spot in place, connect, and energize. You save not only on equipment and installation costs, but also valuable engineering time to use for over-all planning.

These are just a few reasons for the fast-growing trend to unit substations shown in the chart on the opposite page. Your local G-E representative can show you plenty of others. Call or write him. *General Electric Company, Schenectady 5, N. Y.*



EXTRA $5000 SAVED BECAUSE OF FLEXIBILITY

IDEA TO SAVE MONEY: Photo above is close-up of G-E metal-clad auxiliary compartment, installed with rest of Unit Substation. Flexibility permitted Niagara Mohawk to install 48-volt battery, charger, telephone. By doing this instead of using special construction, Niagara Mohawk estimates they saved $5000 to $8000.

321-80

GENERAL ELECTRIC

Trade Marks and Trade Names For Power Cables, Wire, And Insulation

A compilation of trade marks and trade names of insulating materials and of bare and insulated wire and cable used in the electric power field. Not included in the listing are wire and cable products for radio, television, telephone, and allied fields of communication. Data was collected through an Electrical World survey of over 60 wire and cable manufacturers and is based on a table of brand and trade names for electric wire and cable prepared by H. G. Burd of Ansonia Electric Co

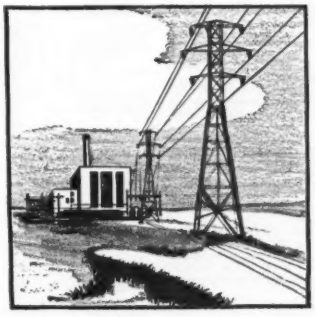
Product	Company	Description
	A	
Abbosealed	U. S. Rubber Co	Non-metallic sheathed cable
ABC	Various manufacturers	Armored bushed cable, N.E.C. Type AC
Accwire	Accurate Insulated Wire Corp	General trade names for cord types
ACR	Anaconda Wire & Cable Co	Heat, moisture and ozone resisting oil base compound
ACSR	American Steel & Wire Co	Aluminum cable steel reinforced
AHR	Anaconda Wire & Cable Co	Type RH building wire
Alcoa EC	Aluminum Co of America	Electric conductor, aluminum
Alectral	General Cable Corp	Aluminum conductors
Alphaduct	Alphaduct Wire & Cable Co	Impregnated loom braid tubing for use as conduit
Alpha-Flex	Alphaduct Wire & Cable Co	Non-metallic sheathed cable
Amarine RW	American Steel & Wire Co	Moisture resisting rubber compounds
" 35	" " " "	" " " "
" 40	" " " "	" " " "
" 60	" " " "	" " " "
Ambersheath	Rome Cable Corp	High-visibility yellow neoprene-jacketed mining cables
Amelectric	Kennecott Wire & Cable Co	Bare WP magnet wire
Amerbestos	American Steel & Wire Co	Asbestos-insulated wire and cable
Amerbus	" " " "	Fibrous covered portable cable
Amerclad	" " " "	Rubber or neoprene sheathed cords and cables
Amerductor	" " " "	Rural distribution bare conductors
Amerfelt	" " " "	Felted type weatherproof wire
Amerglass	" " " "	Glass insulated wires and cables
Amergraph	" " " "	Oil field cords and cables
American	American Flexible Conduit Co	Armored cable
American	American Steel & Wire Co	Braid covered mining cables, elevator cables, tree wire
American-Flex	American Flexible Conduit Co	Non-metallic sheathed cable
Americore	American Steel & Wire Co	Code grade rubber-insulated building wire compound
Amerite	" " " "	Performance grade 30% rubber compound
Amerprene	" " " "	Neoprene sheath compound
Amerseal	" " " "	Non-metallic parkway cable, jute covered
Amersheath	" " " "	Non-metallic parkway cable, rubber or neoprene sheath
Amersteel	" " " "	All steel rural conductor
Amerstrand	" " " "	Galvanized steel strand
Amerzone	" " " "	Ozone and corona-resisting rubber compound
Ametallic	" " " "	Metallic parkway cables, Type RLJFJ
Amperox	" " " "	Type RH building wire, heat resistant rubber compound
Ampolene	" " " "	Polyethylene resin insulation
Ampyrol	" " " "	PVC insulation
AMR	Anaconda Wire & Cable Co	Type RW building wire
Amwar	American Steel & Wire Co	Magnet wire, vinyl acetal insulation
Anecondaloy	Anaconda Wire & Cable Co	Lead alloy coating for copper wire
Anhydrex A	Simplex Wire & Cable Co	Moisture resistant insulation with deproteinized rubber
Anhydrex AA	" " " "	Moisture resistant insulation with deproteinized rubber
Anhydrex AA 35	" " " "	Moisture-resistant insulation 35% deproteinized rubber
Anhydrex AA60	" " " "	Moisture resistant insulation with deproteinized rubber, 60% rubber
Anhydrex AA-LL	Simplex Wire & Cable Co	Moisture resistant combined with super aging deproteinized 60% rubber
Anhydrex SA	" " " "	Moisture resistant insulation with buna replacing deproteinized rubber
Anhydrex Underground	" " " "	Rubber sheathed
Anhydrex XX	" " " "	Heat, moisture and ozone-resistant high-voltage insulation
Anhydroprene	" " " "	Neoprene sheathed cable for use in conduit and ducts
Anoroc	" " " "	Ozone-resisting insulation
Ankoseal	Ansonia Electrical Co	Thermoplastic insulations and jackets
ANW	Anaconda Wire & Cable Co	Rubber and neoprene insulated wet work cable for duct use
AOR	Anaconda Wire & Cable Co	Oil-resistant insulation
Aquanol	General Electric Co	Type RW building wire
Aquasen	Circle Wire & Cable Corp	Type RW building wire
Aquasteal	General Cable Corp	Moisture-resistant, low SIC insulation. Type RW submarine rubber insulation
Armorlokt	American Steel & Wire Co	Interlocking steel tape armor
Armortite	Hazard Insulated Wire Works	Type RJ non-metallic armored underground cable
AVC	American Steel & Wire Co	Asbestos and varnished cambric insulated cords and cables
AVC	Rockbestos Products Corp	Asbestos and varnished cambric power and control cables
	B	
BAC	Eastern Tube & Tool Co	Bushed armored cable
Bakelite	Bakelite Division—Union Carbide & Carbon Corp	Polyethylene wire and cable insulating and jacketing compounds.
Barkhide	General Cable Corp	Tree wire
Beldenamel	Belden Manufacturing Co	Enameled magnet wire
Bethanized	Bathlehem Steel Co	Galvanized steel wire and strand
B.I.W.	Boston Insulated Wire & Cable Co	Heavy duty cords and cable
Black Core	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Type R building wire
Braidx	General Electric Co	Non-metallic sheathed cable
Bronco 40	Western Insulated Wire Co	Rubber-jacketed cords and cables
Bronco 60	Western Insulated Wire Co	Neoprene-jacketed cords and cables
BX	General Electric Co	Interlocking armored cable
	C	
Cablex	Collyer Insulated Wire Co	Non-metallic sheathed cable
Calsum Bronze	Anaconda Wire & Cable Co	Copper-tin-aluminum alloy line wire, rubberized tape and weatherproof braid
Candee	The Okonite Co	Completely insulated weatherproof wire
Canvas Back Loom Wire	National Electric Products Corp	Non-metallic sheathed cables
Celenamel	Belden Manufacturing Co	Enamel and cellophane magnet wire
Center-Red	American Insulated Wire Corp	POSJ portable cord
Circab	Circle Wire & Cable Corp	Neoprene barn cable
Circleduct	" " " "	Impregnated loom braid tubing for use as conduit
Circlemold	" " " "	Heavy duty cords and cables
Circleprene	" " " "	Neoprene-sheathed cables
Circlesheath	" " " "	Neoprene non-metallic parkway cable
Circle-Super	" " " "	Type RH building wire

BUSINESS IN MOTION

To our Colleagues in American Business . . .

Like other suppliers, Revere offers its metals in a wide variety of alloys. This is for the reason that no one metal or alloy is suitable for every purpose, for every requirement. In order to help solve the sometimes complex problems that arise concerning metal specification, fabrication, and use, Revere offers the services of its Technical Advisory Staff. Here is an example of its work.

When an electric utility was re-tubing a condenser, Revere Research had an opportunity to obtain samples of the tubes that were removed. A laboratory examination showed them to be made of an excellent alloy; let us call it "Alloy X," since the tubes were made by a competitor. This alloy is usually specified for conditions of erosion-corrosion, but our examination indicated that the tubes also were subject to severe attack by air entrainment and high-velocity, turbulent water. The Revere Technical Advisor, who inspected the condenser in person, suggested that longer tube life might be obtained if cupro-nickel in the 10% nickel alloy were used. As a test, 50 such tubes were installed alongside the new "Alloy X" tubes.



At the end of only three months, the utility was disturbed to find that some of the "Alloy X" tubes were beginning to fail. Samples were sent to Revere Research, which once again reported that these competitive tubes were good ones, mechanically and as to alloy. The Revere Technical Advisor immediately returned to the utility, where he spent two days and nights on the job, much of the time inside the condenser itself. He found the cupro-nickel tubes in fine condition. Recommendations included putting a perforated iron sheet in the water box to reduce turbulence and air entrainment, and the use of 10% cupro-nickel tubes throughout. These suggestions were followed.

Two years later the cupro-nickel tubes were inspected, and found to be in excellent condition. As a result, a new generating station of the company was equipped with them.

Please note our statement that the tubes made by a competitor were all right as tubes. If Revere Tubes in the same alloy had been installed there, the same trouble would have been experienced. It was natural enough for the utility to blame the tubes, but Revere knows that if condenser tubes do not give long and economical service the fault most probably lies in the selection of an alloy unsuitable for operating conditions. In many cases, as in this one, Revere has been able to suggest changes in alloy or in operation, or both, bringing about important economies for users of condensers.

What Revere does in this way is not unique by any means. Suppliers in every industry do as much for their prospects and customers, every day in the week. They do it gladly, because a happy, satisfied customer is a precious asset. So we suggest that no matter what your business is, no matter what you buy, nor from whom, you take your suppliers into the closest possible confidence, permitting them to learn all they can about the conditions their materials have to meet. This will cost you nothing, and may save you much.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

150th YEAR OF SERVICE TO AMERICA

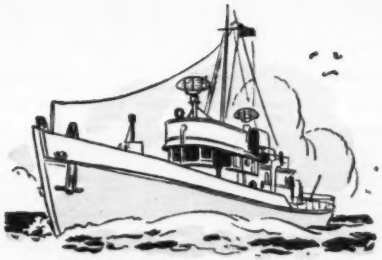
Executive Offices:

230 Park Avenue, New York 17, N. Y.

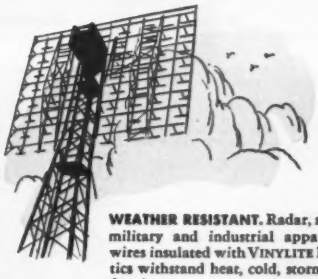
SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Electric Power Cable Trade Names

Product	Company	Description
Circle-Weather-prene	Circle Wire & Cable Corp	Neoprene insulated weatherproof wire
Cirflex	" " " "	Non-metallic sheath cable, Type R insulation
Cirtex	" " " "	Non-metallic sheath cable, Type T insulation
Cliffduct	Clifton Conduit Co	Impregnated loom braid tubing for use as conduit
Clift-X	Clifton Conduit Co	Non-metallic sheathed cable
Coldcote	Anaconda Wire & Cable Co	Weatherproof sealing compound
Columbia-Flex	Columbia Cable & Elec Corp	Non-metallic sheathed cable
Compack	General Cable Corp	Compacted stranded conductor
Condex	Simplex Wire & Cable Co	Metallic interlocking armored park-way cable
Copperweld-Copper Strand	Copperweld Steel Co	Strand of copper-covered steel wires and copper wires and power conductors
Copperweld Strand	" " "	Strand of copper-covered steel wires, O/H ground, guy, and messenger power conductors
Copperweld Solid Wire	" " "	Copper-cover steel wire
Coprsheath	Anaconda Wire & Cable Co	Underground paper-insulated cable with copper sheath
CordX	General Electric Co	All-rubber cords
Corwico	Cornish Wire Co	Electrical wires
Cotenamel	Belden Manufacturing Co	Enamel and cotton magnet wire
Cottonite	Acme Wire Co	Enamel and cotton magnet wire
Crapo	Indiana Steel & Wire Co	Galvanized wire and strand
Crescord	Crescent Insulated Wire & Cable Co	All-rubber cords and cables
Cresflex	" " "	Non-metallic sheathed cable
D		
DD Duroseal	Anaconda Wire & Cable Co	Non-metallic parkway cable
Deltabeston	General Electric Co	Asbestos-covered insulated wire and cable
Deltaglass	General Electric Co	Glass-insulated magnet wire
Densheath	Anaconda Wire & Cable Co	Flame retarding all purpose PVC insulation or jacket, 600 v
Dilec	National Electric Products Corp	R. C. building wire with cotton wrap in place of braid
Dilex Latex	U. S. Rubber Co	Type RU, RUW, or RUH wire
Dilex-Safecote	John A. Roebling's Sons Co	Building wire; cotton wrap in place of braid
Dreadnaught	Paranite Wire & Cable Div—Essex Wire Corp	Heavy-duty rubber-sheathed port-able cords and cables
Dualay	The Okonite Co	Periodic reversal of conductor lay in multi-conductor assembly to per-mit tapping without cutting con-ductor
Dual-Purpose	Rome Cable Corp	Type RW-RH building wires
Ducoduct	Insulated Duct & Cable Co	Impregnated loom braid tubing for use as conduit
Duracode	Anaconda Wire & Cable Co	Code grade wire and cable
Duracord	" " " "	Loom-covered portable conductors, cables, and tree wire
Duraduct	" " " "	Impregnated loom braid tubing for use as conduit
Duraline	" " " "	Weatherproof O/H line wire; fibrous Type URC covering
Durall	" " " "	Neoprene, barn type, non-metallic sheathed cable for moist locations
Duraprene	" " " "	All-rubber insulated building wire, 600 v
Duraseal, Type A	" " " "	Non-metallic aerial cable
" Type D	" " " "	" duct "
" Type T	" " " "	" parkway "
Durasheath	" " " "	Neoprene jacket compound
"	" " " "	Type RW insulation, neoprene jacketed
"	" " " "	All-rubber cable for aerial, duct, or buried use
Duratube	" " " "	Impregnated loom braid tubing for use as conduit
Duratwin	" " " "	Type POSJ portable cord
Durex	" " " "	Neoprene, barn type, non-metallic sheathed cable
Durex Junior (Type CNX)	" " " "	Neoprene, barn type, non-metallic sheathed cable with concentric bare neutral
Dutrax	" " " "	Type T non-metallic sheathed cable with Densheath insulation
Dynaprene	Whitney-Blake Co	Neoprene-jacketed flexible cords
E		
Enamelite	Acme Wire Co	Enameled magnet wire
Endurite	Crescent I. W. & C. Co	Type RH building wire
Enterite	General Cable Corp	Service drop cable
Eonite	U. S. Rubber Co	Heat-resistant 35% rubber com-pound
Ettco Tube	Eastern Tube & Tool Co	Impregnated loom braid tubing for use as conduit
Ettco-Flex	Eastern Tube & Tool Co	Non-metallic sheathed cable
Everdur	Anaconda Wire & Cable Co	Copper-silicon-manganese alloy
F		
Fibrex	Simplex Wire & Cable Co	Non-metallic taped tree wire, drop wire, alarm cable
Firefite	American Steel & Wire Co	Building wire; flame-retarding and moisture-resisting finish
Firekrome	Hazard Insulated Wire Works	FRWP (flame resistant) finish for building wire
Firestop	National Electric Products Corp	MRFR finish for building wire
Flamenol	General Electric Co	Thermoplastic polyvinyl insulated wire and cable
Flamestop	Habirshaw Cable & Wire Div—Phelps Dodge Copper Prod Corp	FRWP finish for building wire
Flexlay	National Electric Products Corp	Full metallic and non-metallic armored parkway cables
Flexocord	Paranite Wire & Cable Div—Essex Wire Corp	Heavy duty cords and cables
Flex-Steel	National Electric Products Corp	Flexible metallic conduit
Flex-Tube	National Electric Products Corp	Impregnated loom braid tubing for use as conduit
Formvar	Shawinigan Chemical Co	Vinyl acetate insulating varnish
Formbond	Acme Wire Co	Thermoplastic resin over "Formvar wire"
Formex	General Electric Co	Vinyl acetal insulated magnet wire
G		
Gencalloy-A	General Cable Corp	Arsenical lead alloy
Gencaseal	" " "	Thermoplastic polyvinyl types in-sulation and jackets
Gencorone	" " "	Ozone-resistant insulation
Geon Resin 404	B. F. Goodrich Chemical Co	Polyvinyl insulating resin
Geoprene	General Electric Co	Sheath or jacket compounded with neoprene
Geotrol	General Electric Co	Gasoline and oil-resistant cable
Glazon	Triangle Conduit & Cable Co	Building wire with glass braid finish
Glazon-Triex	Triangle Conduit & Cable Co	Non-metallic sheathed cable
Glyptal	General Electric Co	Insulating and protective resin-base varnishes
Gran-ite	U. S. Rubber Co	Service entrance, Type SE & SD wire
Grizzly	" " "	Service entrance; non-metallic park-way cable
Guardian	General Cable Corp	Building wires and cables, Type P, RH, RW, T, TW, V. C.
H		
Habir-Bus	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Special construction for bus duct system of power distribution
Habirdry	" " "	Type RW building wire
Habirduct	" " "	Type RW network insulation
Habirdure	" " "	Thermoplastic PVC insulation
Habirite	" " "	Corona-resisting insulation
Habirlene	" " "	Polyethylene line wire
Habirprene	" " "	Neoprene sheathed cable
Hatex	Hatfield Wire & Cable Co	Non-metallic sheathed cable
Hazacode	Hazard Insulated Wire Works	Type R building wire
Hazacord	" " " "	Mold-cured neoprene-jacketed portable cords and cables
Hazakrome	" " " "	Thermoplastic-insulated building wires
Hazalatex L	" " " "	Natural rubber latex insulation
Hazalatex N	" " " "	Composite wall of natural rubber latex insulation and protective neo-prene latex
Hazalene	" " " "	Low-loss thermoplastic polyethylene insulation and sheath
Hazaprene	" " " "	Flame-resisting neoprene jacket
Hazaprene Latex	" " " "	Neoprene-latex wall applied as pro-tection over natural rubber Haza-latex L
Hazardex	" " " "	Non-metallic, fibrous sheathed cable, rubber insulated conductors
Hazardex T	" " " "	Non-metallic sheathed cable, ther-moplastic-insulated conductors
Hazardex-Watertite	" " " "	Non-metallic sheathed cable-moist locations
Hazasheath	" " " "	Neoprene-jacketed, non-metallic underground cable
Hazasheath	" " " "	Neoprene-jacketed loom braid
HH	General Cable Corp	Hollow-core copper conductor
Hi-Temp	Rockbestos Products Co	High temperature asbestos-insulated wires and cables
Hitenso A	Anaconda Wire & Cable Co	Copper-cadmium alloy
Hitenso BB	" " " "	Copper-cadmium alloy
Hitenso C	" " " "	Copper-tin-cadmium alloy
HT Type	American Steel & Wire Co.	Tree wire, high text ASA Standard
Hudco	Hudson Wire Co	Copper wire
Hydroseal	Paranite Wire & Cable Div—Essex Wire Corp	Type RW building wire
Hyfilm	Acme Wire Co	Thin high-dielectric varnished cam-bric
Hy-Term	Anaconda Wire & Cable Co	High-annealing-temperature copper wire
Hyvolt	Crescent Insulated Wire & Cable Co	Heat, moisture and ozone-resistant high-voltage insulation
I		
Icoduct	Insulated Duct & Cable Co	Impregnated loom braid tubing for use as conduit
Imperial	Crescent I. W. & C. Co	Neoprene-jacketed portable cables
Imperial Crescord	" " "	Neoprene-jacketed cords
Impervex	" " "	Type RW building wire
Impervex Trenchcable	" " "	Non-metallic parkway cable
Inca	Phelps-Dodge Copper Products Corp	Magnet wire
Indestructo	National Electric Products Corp	Neoprene-jacketed cords and cables
Ironite	Anaconda Wire & Cable Co	R. C. iron telephone and tree wire
IXL	Collyer Insulated Wire Co	Rubber-insulated wire
K		
Kenline	Kennecott Wire & Cable Co	Line of overhead conductor
Kenrite	American Insulated Wire Corp	Asbestos-covered cords
Kerite	The Kerite Co	Heat, moisture, and ozone-resistant insulation
Keystone	Hazard Insulated Wire Works	Heat, moisture and ozone-resistant oil-base insulation
Keystone-Hazaprene	Hazard Insulated Wire Works	Heat, moisture and ozone-resistant oil-base insulation with neoprene jacket



SALT AIR-PROOF. Shipboard wires and cables insulated with VINYLITE Brand Plastics resist salt air, water, oils, greases.



WEATHER RESISTANT. Radar, radio, other military and industrial apparatus with wires insulated with VINYLITE Brand Plastics withstand heat, cold, storms, mildew, fungi.

Cut Maintenance Get Permanence

CHEMICAL RESISTANT. Dairies, chemical plants, refineries, factories are widely equipped with VINYLITE Brand Plastic insulated wires that fight chemicals, moisture, oils, greases, acids.

USE WIRE INSULATED WITH...

Your wires and cables work double, triple, quadruple time—insulated with VINYLITE Brand Plastics!

Even in the toughest locations—under water, under ground, aboard ships, in chemical plants and dairies—these durable, highly flexible, heat- and cold-resisting materials outlast older conventional insulating compounds to a degree that's hard to believe.

The reasons are simple: They're extremely resistant to water, alkalies, most strong acids, brine, other chemicals, and oils and greases. They maintain their excellent electrical properties and flexibility at temperatures from —60 deg. F. up to 220 deg. F. They are non-flammable. Smooth surfaces speed pulling through conduits and around corners. Endless lasting colors assure positive color coding and tracing.

Their smaller diameters take up less space. Light weight means longer spans. They strip easily, yet resist abrasion and wind-slapping. They resist deterioration from sunlight, aging, fungi, mildew.

You'll find that they cut maintenance costs to a fraction of that experienced with lower quality insulation. For technical data, and a list of representative suppliers, write Dept. LI-28.

MEMO TO WIRE MANUFACTURERS

Important data on the use of BAKELITE Polyethylene and VINYLITE Brand Plastics for insulating and jacketing power and control wires and cables for chemical plants is now yours for the asking. Just send for "Kabelitems No. 54." The record of these materials in preventing power failure, despite exposure to extremely corrosive chemicals and solvents during years of service, is well documented. Their excellent electrical, mechanical, and chemical properties, plus ease of extrusion, warrant your careful study.

Vinylite BRAND **PLASTICS**

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N.Y.

Electric Power Cable Trade Names

Product	Company	Description
L		
Latox	Simplex Wire & Cable Co	90% pre-vulcanized latex (obsolete)
Laytex	U. S. Rubber Co	Type RU, RUW, or RUH 90% unmilled rubber latex
Line-Tap	The Okonite Co	Self-supporting aerial cable that can be tapped hot
Loomwire	National Elec. Products Corp	Non-metallic sheathed cable
Loxbronze (Parkway)	Hazard Insulated Wire Works	Type RLJIJ with interlocking bronze armor
Loxsteel (Parkway)	" " " "	Type RLJIJ underground cable with interlocking steel armor
Loxzinc (Parkway)	" " " "	Type RLJIJ with interlocking zinc armor
M		
Mid-Rip	General Cable Corp	POSJ portable cord
Moistemp	Rockbestos Products Co	Asbestos-insulated wires and cables
MRFR	Anaconda Wire & Cable Co	FRWP types of finish
Mummy	The Kerite Co	Type RJ (asphalt slush and jute wrap for underground cable)
N		
Nada	Copperweld Steel Co	Bronze wire
Narex	Narragansett Wire Co	Non-metallic sheathed cable
Narwire	Narragansett Wire Co	Type R, Type T or TW building wire
Neasbestos	National Electric Products Corp	Asbestos V. C. wires and cables
Neolay	U. S. Rubber Co	Laytex and neoprene insulation with nylon jacket
Neoline	Anaconda Wire & Cable Co	Neoprene-covered weatherproof O/H wire
NE-on	National Elec. Products Corp	Type T or TW building wire or machine tool wire
NE-O-Prene	" " " "	Neoprene insulated and jacketed, non-metallic sheathed cable for moist locations
NE-O-Prene	" " " "	Neoprene-jacketed service entrance cable
Neoproof	American Steel & Wire Co	Neoprene-coated line wire
Neotherm	National Elec. Products Corp	Type RH building wire
Nepcoseal	" " " "	Type RW building wire
Nepcozone	" " " "	Heat, moisture, and ozone resistant oil-base insulation
Neposeal	" " " "	Type T or TW building wire
Neutraline	Anaconda Wire & Cable Co	Braid-covered saturated wire, neutral painted white
Nometal	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Non-metallic rubber parkway cable
Nubun	U. S. Rubber Co	GR-S laytex insulation
O		
Oakex	Acorn Insulated Wire Co	Non-metallic sheathed cable
Oilostatic	The Okonite Co	Paper-insulated cable operated in welded steel pipe line filled with oil under high pressure
OilX	General Electric Co	All-rubber cords
OilX Jr.	General Electric Co	All-rubber cords
OK	General Cable Corp	Double or triple-braid URC weatherproof wires and cables
Okite	Acorn Insulated Wire Co	Type T or TW building wire
Okobestoprene	The Okonite Co	Non-flammable asbestos-base tape for cable assemblies
Okobestos	" " "	Heat and flame-resistant asbestos insulation
Okocal	" " "	Paper-insulated cable
Okocord	" " "	Portable cords and cables with rubber or Okoprene sheaths
Okoglass	" " "	Non-combustible and heat-resistant glass insulated wire and cable
Okoground	" " "	Insulated flexible cable for temporary grounding of overhead lines
Okojute	" " "	Non-metal, jute-protected track wire
Okolast	" " "	Tree wire with brake lining armor and braid covering treated for high abrasion resistance
Okolene	" " "	Low loss thermoplastic polyethylene-base insulation
Okolite	" " "	Moisture, heat, and corona resistant oil-base rubber insulation
Okolite-Okoprene	" " "	Moisture, heat, and corona resistant insulation with Okoprene jacket
Okoloom	" " "	Tree wire or other wire with heavy fire-hose loom woven braid
Okoloy	" " "	Corrosion-resistant lead alloy coating for copper conductor
Okometal	" " "	Special lead sheath alloy for paper-insulated cables
Okonite	" " "	30% Mineral-base rubber insulation
Okoprene	" " "	Oil, heat, ozone, and weather-resistant sheath made with neoprene
Okoseal	" " "	Thermoplastic PVC insulation
Okosheath	" " "	Moisture-resistant rubber compound serving as insulation and sheath
Okosheath Protect Covering	" " "	A vulcanized covering of reinforced Okoprene used over lead sheaths to eliminate corrosion
Okotel	" " "	See Hazatel
Okotherm	" " "	Silicone heat-resistant rubber insulation
Okover	" " "	Varnished cambric insulation
O. N. C.	General Electric Co	Asbestos-insulated cable
Ovalflex ABC	National Elec. Products Corp	Flat twin ABC armored cable
P		
Paracore	U. S. Rubber Co	Types R, RH, RW building wire cable
Paracote	Paranite Wire & Cable Div—Essex Wire Corp	Fibrous-covered building wire and cable
Paraduct	" " " "	Impregnated loom braid tubing for use as conduit
Paraflex	" " " "	Non-metallic sheathed cable
Paragon	General Electric Co	Insulating tape
Paragon Ironite	Paragon Electric Co	Iron conductor, rubber-braid URC finish
Paragon Paraprene	" " "	High-tensile bronze conductor, neoprene-jacketed telephone drop wire
Paragon URC Braid	" " "	Iron conductor, rubber-braid URC finish
Paraprene	Paranite Wire & Cable Div—Essex Wire Corp	Neoprene insulating compound
Paraseal	" " " "	Non-metallic parkway cable
Parasyn	" " " "	Thermoplastic PVC insulation
Paratherm	" " " "	Type RH rubber-covered building wire
Paratwin	" " " "	POSJ portable cord
Parause	" " " "	Non-metallic underground cable
Parkerite	Seward	R. C. building wire
PDX	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Non-metallic sheathed cable
Peerless	General Cable Corp	Cotton-felted and cotton braid URC weatherproof wire and cable
Peerless SD	General Cable Corp	Peerless type service drop cable
Performite	Hazard Insulated WireWorks	Type RH building wire
Permacord	Crescent Insulated Wire & Cable Co	Heavy-duty portable cords and cables
Permex-Latex	Hazard Insulated WireWorks	Type RU building wire; 90% unmilled grainless rubber insulation applied by dip process
PIW-Easy Slip	Philadelphia Insulated Wire Co	POSJ portable cord
Plastex	Simplex Wire & Cable Co	Thermoplastic PVC insulation
Plasticon	Plastic Wire & Cable Corp	Type T or TW building wire
Plastiseal	Anaconda Wire & Cable Co	Plastic-encased magnet wire coil
Plastite	Whitney Blake Co	Synthetic resin insulation
PNR	Rockbestos Products Corp	Multi-conductor control cable
Polene	Anaconda Wire & Cable Co	Overhead line wire, polyethylene weatherproof covering
Powerduct	Anaconda Wire & Cable Co	Loom construction for bus duct system of power distribution
PreenX	General Electric Co	Heat-resistant cords
P. S. Shielding	American Steel & Wire Co	Conducting rubber shielding tape
PVC	Plastic Wire & Cable Corp	Thermoplastic polyvinylchloride
PVX	General Electric Co	Non-metallic sheathed cable, especially with polyvinyl insulation
Q		
Quaridge	Boston Insulated Wire & Cable Co	Rubber sheathed cord and cable
R		
Radix	Radix Wire Co	Asbestos and thermoplastic-insulated wire
Raylock	General Electric Co	Building wire
Reliable	Wheeler Insulated Wire Co	Electrical wire
Reliance	American Steel & Wire Co	Weatherproof and slowburning wires
Resistal	Collyer Insulated Wire Co	Thermoplastic PVC
Rip-Flex	Hatfield Wire & Cable Co	POSJ portable cords
RoBarn	Rome Cable Corp	Non-metallic sheathed cable, neoprene barn type
Rockbestos AVC	Rockbestos Products Corp	ASB—VC—ASB
Roebling	John A. Roebling's Sons Co	Braid finish on building wire, flame resistant
Roebond	" " " "	Plastic plus bond coat on magnet wire
Roebx	" " " "	Non-metallic sheathed cable
Roecable	" " " "	Neoprene-jacketed, jute-filled portable cables
Roeclad	" " " "	Same as Roecable with rubber filler
Roecord	" " " "	Heavy-duty cords and cables, rubber sheathed
Rocozone	" " " "	Oil-base, ozone-resisting, synthetic rubber insulation
Roeglas	" " " "	Glass-insulated magnet wire
Roeplastic	" " " "	Thermoplastic polyvinyl insulation
Roeprene	" " " "	Neoprene-jacketed mining machine cables
Roesheath	" " " "	30% rubber insulated, 60% rubber-jacketed underground cables
Roevar	" " " "	Vinyl acetal magnet wire
Roeweld	" " " "	60% rubber jacketed welding cable
RoFlex	Rome Cable Corp	Non-metallic sheathed cable
Roilcord	John A. Roebling's Sons Co	Neoprene-jacketed heavy duty Type SO and SJO
RoLene	Rome Cable Corp	Polyethylene-thermoplastic insulation or sheath
RoLon	" " "	Nylon insulation or sheath
RoMarine	" " "	Type RW-RH rubber insulation
RoMarine-RoPrene	" " "	Type RW-RH rubber-insulated, neoprene-sheathed power cable; Type USE, Style RR
Rome Synthinol	" " "	Polyvinylchloride thermoplastic insulation and sheath
Romex-N	General Cable Corp	Neoprene type non-metallic sheathed cable
Romex T	" " "	Type T, insulated, non-metallic sheathed cable
Rome 40	Rome Cable Corp	Rubber-jacketed portable cord
Rome 60	" " "	Neoprene-jacketed portable cord and cable
RoNeon	" " "	Neon sign and oil-burner ignition cable

Over 10,000 installed in one city... for good reason!

Installing a good street lighting system is only part of the job. Equally important is the maintenance of that system. For example, Cleveland gets these maintenance advantages by using the AK-10!

1. They save time on routine washing and relamping because of the automatic latch-on device. Maintenance is a speedy one-man operation.
2. They get longer reflector life because this is the heaviest aluminum reflector of any unit of its type available today. This provides greater mechanical strength and a better reflecting surface.
3. They get better maintained lumen efficiency throughout the life of the lamp, because this unit is 25% larger than other units and, therefore, has a lower operating temperature.

Check the standardized line of interchangeable street lighting units available at Westinghouse. Send today for B-4237, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE... IF IT'S
Westinghouse

LIGHTING DIVISION
Edgewater Park, Cleveland

J-04301

Electric Power Cable Trade Names

Product	Company	Description
RoPrene	Rome Cable Corp	Neoprene insulation or sheath
RoPrene Service Drop	" " "	Neoprene insulated power conductor twisted around neutral messenger
Royal	U. S. Rubber Co	Rubber sheathed cords and cables
Royal Gold	" " "	Neoprene-jacketed portable cords, latex insulated neoprene jacket; mine cables
Royal Master	" " "	Latex-insulated neoprene jacket; heavy duty cords
RoZone	Rome Cable Corp	Ozone-resistant oil-base insulation
RS-Supersheath	U. S. Rubber Co	1/C cables with insulation and jacket one integral wall
Rubberflit	Collyer & Providence	POSJ portable cords
Rubcord	U. S. Rubber Co	HSJ heater cord
Rubsec	" " "	Moisture-resisting grade wires and cables
Ruralay	General Cable Corp	Non-metallic rural underground cable
Ruralductor	Bethlehem Steel Co	Galvanized steel wire for rural transmission
Rurex	U. S. Rubber Co	Neoprene-jacketed non-metallic sheathed cable

S

S (Suffix)	American Steel & Wire Co	Indicates synthetic rubber compound
Safecote	National Electric Products Corp	Braid finish on building wire, flame and moisture-resistant
Safetyarm	M. B. Austin Co	Armored cable
Safety m. i. wiring	General Cable Corp	Mineral insulated wiring
Salamander	General Electric Co	Asbestos-insulated wire and cable
Seabestos	Simplex Wire & Cable Co	Rubber and asbestos-sheath elevator cable
Sealtite	Collyer Insulated Wire Co	Non-metallic parkway cable, interlocking steel armor
Security-Flex	Anaconda Wire & Cable Co	All-rubber sheathed portable cords and cables
Semicon	The Okonite Co	A semi-conducting treated tape or compound
Sheathtite	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Non-metallic parkway cable
Shield Brand	Ampenia Electrical Co	Weatherproof wire and cable
Slainese	Essex Wire Corp	POSJ portable cord
Silkenamel	Belden Manufacturing Co	Enamel and silk magnet wire
Silkenite	Acme Wire Co	Enamel and silk magnet wire
Silotex	Anaconda Wire & Cable Co	Silicone-class magnet wire
Simcore	Simplex Wire & Cable Co	Type R building wire
Sno-Flex	Hazard Insulated Wire Works	White, non-metallic sheathed cable
Spiralok	American Metal Molding Co	Interlocked metallic armor
Spiralon	Suprenant Manufacturing Co	PVC insulation—spiral tracer strip with nylon jacket
Spiralweave	Hazard Insulated Wire Works	Fire-hose type loom-woven braid
Stabilized Lead	The Okonite Co	Sodium-treated lead
Star	Acme Wire Co	Impregnating and molding coil and component compound
Strip-X	General Electric Co	All-rubber cord
Style C	Anaconda Wire & Cable Co	Service drop cable, 2/C Underwriters' Type S. D.
Style CF	" " " "	Service drop cable, 3/C
Style SC	" " " "	Service entrance cable, 2/C Underwriters' Type SE
Style SC-100	" " " "	Service entrance cable, 2/C Underwriters' Type SE copper armor Type, theft proof
Style SCF	" " " "	Service entrance cable, 3/C Underwriters' Type SE
Style SC-FA	" " " "	Service entrance cable, 2/C Underwriters' Type SE with flat steel tape over insulated neutral
Style SCF-100	" " " "	Service entrance cable, 3/C Underwriters' Type SE
Style SCF-FA	" " " "	Copper armor type, theft proof service entrance cable, 3/C Underwriters' Type SE with flat steel tape over insulated neutral
Style SDC	Triangle Conduit & Cable Co	Service drop cable
Style SSD	Anaconda Wire & Cable Co	Exposed neutral-type Underwriters' Aporoved service drop cable
Submarine	Hazard Insulated Wire Works	Moisture-resistant insulation now called Watertite
Sunex	Anaconda Wire & Cable Co	Jacket compound resistant to actinic rays of the sun
Sunex Security-Flex	" " " "	60% rubber-jacketed cables and cords
Super Coronol	General Electric Co	Ozone-resistant butyl insulated (80 C) wire and cable
Super-Eonite	U. S. Rubber Co	Heat and moisture-resistant compound
Super-Flex	Hatfield Wire & Cable Co	60% rubber-jacketed cords and cables
Super-Flex-Hatex	" " " "	60% rubber-jacketed cords and cables
Superlite	General Cable Corp	Thin-wall rubber insulation
Super PVX	General Electric Co	Non-metallic sheathed cable
Super-Seal	Anaconda Wire & Cable Co	Sealing Compound
Supersec	U. S. Rubber Co	Type RW building wire (See Rubsec)
Super Services	General Cable Corp	Neoprene jacketed flexible cords and portable cables
Supersheath	" " "	Uni-insulation and jacket, rubber compound
Supersheath-N	" " "	Moisture resistant insulated neoprene-jacketed cables
Supertex	Simplex Wire & Cable Co	Latex (Obsolete)
Supreme Type RR	Collyer Insulated Wire Co	RW insulation on neoprene jacket U. S. E.
Surco	Surprenant Mfg. Co	Plastic-insulated wire and cable
Surety	Circle Wire & Cable Corp	R. C. building wire
Synrub	U. S. Rubber Co	PVC insulation
Synthinol	Rome Cable Corp	Polyvinylchloride thermoplastic insulation and sheath
Synthol	Crescent Insulated Wire & Cable Co	PVC insulation

T

Teleplated	Whitney Blake Co	Lead alloy coated copper plus brass coating
Telex	Simplex Wire & Cable Co	Neoprene-jacketed 2/C flat underground telephone cable
Tempernol	General Electric Co	Heat resistant Type RH compound
Tensilok	General Cable Corp	High temperature-annealing copper conductor
T-Flex	Paranite Wire & Cable Div—Essex Wire Corp	Non-metallic sheathed cable
Thermex	General Cable Corp	Heat-resistant insulation
Thermex W	General Cable Corp	Moisture and heat-resistant insulating compound
Thermocable	Hazard Insulated Wire Works	Rubber insulated interlocking armor thermostat cable
Thermocon	Kennecott Wire and Cable Co	Special overhead conductor, annealing resistant
Thermoprene	Whitney Blake Co	Neoprene jacketed Type RH
Thermoseal	National Elec. Products Corp	RW 60C-RH 75C dual-purpose wire insulation
Thinwol	General Electric Co	Cable with thin rubber insulation
Tip-Top	General Cable Corp	Neoprene-covered weatherproof wire
Tirex	Simplex Wire & Cable Co	Neoprene-jacketed cord and cables
Traprene	Triangle Conduit & Cable Co	Neoprene-sheathed cable
Trenchcable	Crescent I. W. & C. Co	Non-metallic parkway cable
Trenchlay	General Cable Corp	Non-metallic underground cable
Trench Type Nometal	Habirshaw Cable & Wire Div—Phelps Dodge Copper Products Corp	Non-metallic sheathed cable
Trenchwire	Crescent I. W. & C. Co	Single-conductor Type USE
Triadry	Triangle Conduit & Cable Co	Type RW building wire
Triex	" " "	Non-metallic sheathed cable
Trioprene	" " " "	Type RR non-metallic underground cable
Trioseal	" " " "	PVC thermoplastic insulated building wire, Type TW
Triplastic	" " " "	PVC thermoplastic insulated building wire, Type TW
Tru-Rio	Whitney Blake Co	POSJ portable cords
Twin Crescord	Crescent Insulated Wire & Cable Co	POSJ portable cord
Twin Cord	Belden Manufacturing Co	POSJ portable cord
Type AB	Anaconda Wire & Cable Co	Butyl higher-voltage cable
Type ABP	Anaconda Wire & Cable Co	Butyl-polyethylene all purpose higher-voltage cable
Type GPC	American Steel & Wire Co	Gas pressure-compensated paper insulated cable
Type H	General Cable Corp	Solid-type, paper-insulated, shielded power cable
Type HT	American Steel & Wire Co	Tree wire, high test ASA Standard
Type ML	" " " "	"Multi-lead" paper-insulated cable
Type PFT	" " " "	Preformed armor rods
Type PS	" " " "	Non-metallic shielding; non-metallic shielded cables
Type RSA	Anaconda Wire & Cable Co	Rural secondary cable

U

Unilay	The Okonite Co	Insulated conductors or wire strands twisted in same direction for flexibility
U. S. Cord	U. S. Rubber Co	30%–40% All-rubber cords
USE-Style RR	Rome Cable Corp	Romarine-Roprene approved U.S.E.
Usex	U. S. Rubber Co	Non-metallic sheathed cable
Uskorona	" " "	Heat, moisture, and ozone-resistant insulation
Usrub	" " "	Building wires and cables

V

Versatol	General Electric Co	Heat, moisture, and age-resistant insulated cable
Verticol	The Okonite Co	High-viscosity impregnant for paper and varnish cambric cables
Vinylite	Bakelite Div—Union Carbide & Carbon Corp	Wire and cable insulating and jacketing compounds
Vitronamel	Anaconda Wire & Cable Co	Glass-fiber-insulated magnet wire, enamel bond
Vitrotex	Anaconda Wire & Cable Co	Glass-insulated magnet wire
Vulcan	Paranite Wire & Cable Div—Essex Wire Corp	30%–40% All-rubber cords, CV cured
Vulcaprene	Paranite Wire & Cable Div—Essex Wire Corp	Neoprene-sheathed cords

W

Walkerflex	Walker Brothers	Non-metallic sheathed cable with R conductors
Walkerprene	" "	Type USE underground cable
Walker-T-Flex	" "	Non-metallic sheathed cables with T conductor
Wanlox Brand	Phelps-Dodge Co	Weatherproof wire
Watertite	Hazard Insulated Wire Works	Heat and moisture-resistant rubber insulation
Wireduct	The Wiremold Co	Non-metallic flexible conduit
Wiroseal	Anaconda Wire & Cable Co	Magnet wire coil with one-piece covering

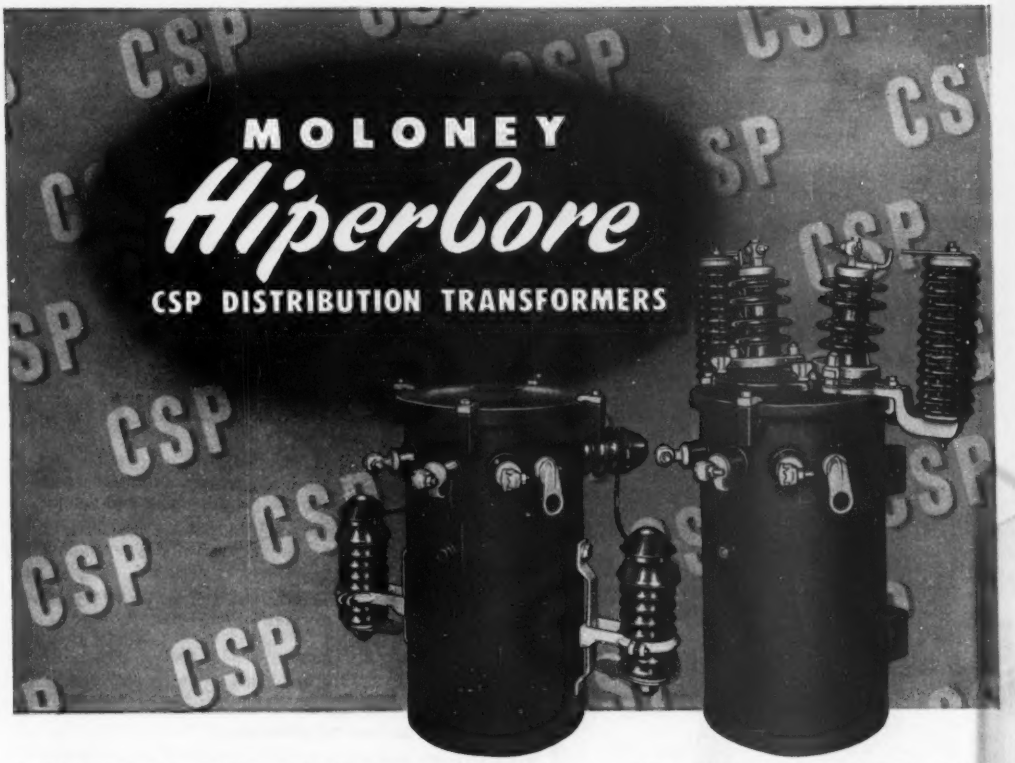
Z

ZBF	Hazard Insulated Wire Works	Hazaprene flame-resisting neoprene sheath
Zipcord	U. S. Rubber Co	POSJ portable cords

MOLONEY

HiperCore

CSP DISTRIBUTION TRANSFORMERS



DESIGNED TO MEET YOUR NEEDS BETTER . . . AND MORE ECONOMICALLY!

The Moloney HiperCore CSP Transformer with wound cores of cold-rolled silicon steel combines superior operating characteristics with low maintenance costs. Operating records show the better voltage regulation and greater short-time overload capacity of the HiperCore Transformer.

The CSP equipment contributes to the low maintenance costs on these transformers. Not only are they protected against lightning surges and short circuits, but also against overloads which tend to shorten the life of a transformer.

CSP equipment consists of the following: Lightning arresters, primary fuses, tank grounding gaps (on tanks not solidly grounded), and secondary circuit breaker with indicating light (to indicate overload).

Simplicity of design of the core-and-coil unit plus liberal use of materials and adequate cooling ducts make HiperCore Transformers cooler operating and better performing, resulting in longer life under normal operating conditions.

CHECK THESE FEATURES of all HIPERCORE TRANSFORMERS

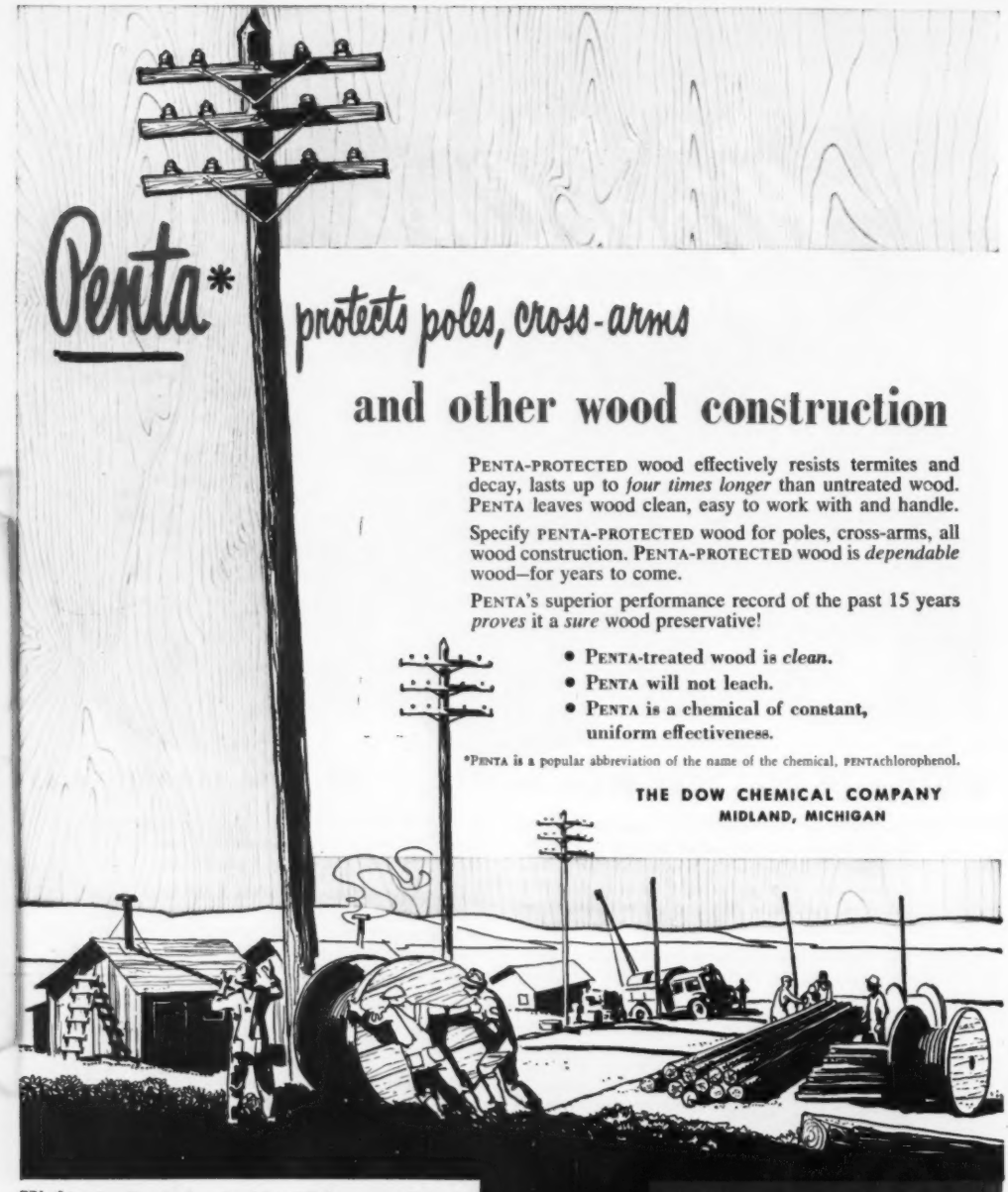
- ✓ **Excellent voltage regulation**
- ✓ **High short-time overload capacity**
- ✓ **Light weight**
- ✓ **Small size**
- ✓ **Long operating life**
- ✓ **Low temperature gradient**

MEBI-17

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA



Penta*

protects poles, cross-arms

and other wood construction

PENTA-PROTECTED wood effectively resists termites and decay, lasts up to *four times longer* than untreated wood. PENTA leaves wood clean, easy to work with and handle.

Specify PENTA-PROTECTED wood for poles, cross-arms, all wood construction. PENTA-PROTECTED wood is *dependable* wood—for years to come.

PENTA's superior performance record of the past 15 years *proves* it a *sure* wood preservative!

- PENTA-treated wood is *clean.*
- PENTA will not leach.
- PENTA is a chemical of constant, uniform effectiveness.

*PENTA is a popular abbreviation of the name of the chemical, PENTAchlorophenol.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Write *for Dow's free booklet, "Pointers on Penta"*

The Dow Chemical Company
Dept. PE-20A
Midland, Michigan

Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
Penta
chlorophenol

Maintenance Truck Designed To Save Labor

J. L. SMITH
Supervising Engineer
Underground Division
Construction Dept
Commonwealth Edison Co
Chicago

Labor saving devices have been incorporated in six conduit maintenance trucks placed in service recently by Commonwealth Edison Co. Features incorporated in the design of these trucks include:

1. No compartments opening to outside of truck, as safety precaution against traffic accidents.

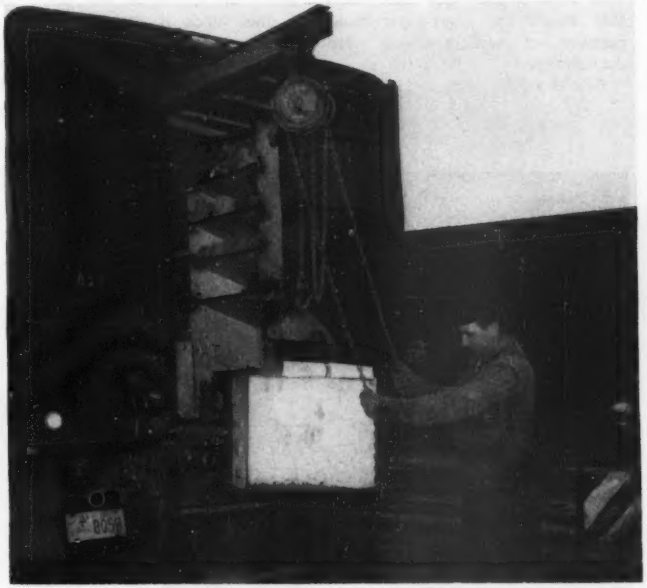
2. Adequate bins and shelves on inside.

3. Special square buckets to hold loose materials such as sand, cement, and bricks.

4. Chain fall and trolley on overhead rail for loading and unloading buckets. Overhead rail can be pulled about 3 ft beyond end of truck for this purpose. Equipment is also used to load and unload heavy materials such as frames and covers.

5. Seats in truck body make crew comfortable while traveling. Forced-air gasoline heater keeps truck warm in coldest weather.

6. Each truck is equipped to tow a trailer-type air compressor unit when required.



LABOR SAVING features of new conduit maintenance trucks include chain fall and trolley for handling square metal buckets which hold loose material

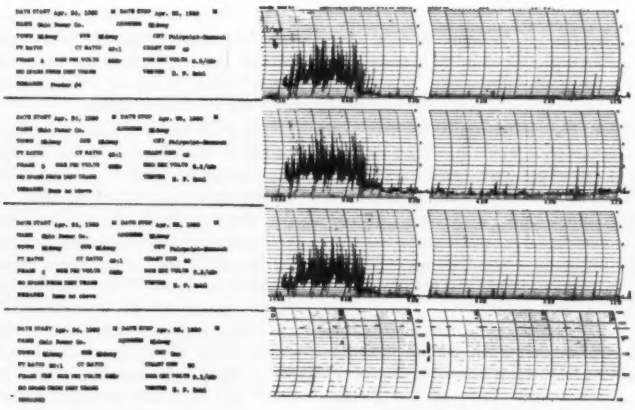
It is expected that 5 to 10% more work will be performed with the new trucks due to increased efficiency in storing and handling tools and equipment on the Commonwealth Edison System.

Use Printed Data Sheets with Feeder Survey Charts

C. C. LINARD
Engineer
Meter Dept
Ohio Power Co
Bellaire, Ohio

More consistently legible data, improved appearance and reduction in labelling time have been effected by using a printed data sheet for attachment to feeder load and voltage survey charts. The data are typed in the blank spaces with carbon backing to increase legibility. When a data sheet is required for each end of the chart assembly, it may be typed in duplicate by using carbon paper front and back.

The printed data sheet was devised to overcome the frequent complaints of illegibility of rubber-stamp labels. The stamps were used with opaque ink and the labelled spaces filled in by hand using pen and India ink.

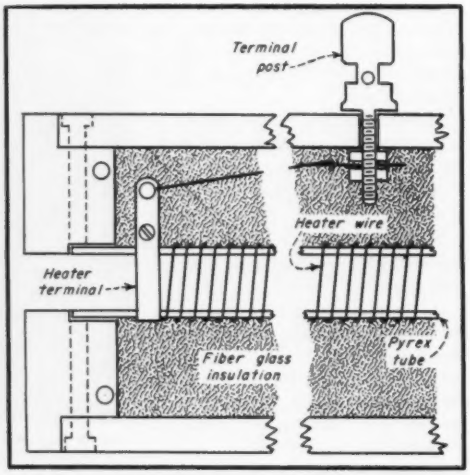


REDUCE LABELING TIME and improve appearance by attaching printed data sheet to feeder load and voltage survey charts. Data are typed in blank spaces using carbon backing to increase legibility. Charts are sewn together on sewing machine

Consideration must be given to the quality of paper used for printing the data sheets so that they will reasonably match the chart-paper transparency and avoid increasing reproduction time.

Four 3 x 6 in. labels can be printed on an 8½ x 12½ in. sheet and separated by lines. Lines could be printed above the top block and below the bottom block if desired, leaving a ½-in. margin top and bottom. The margin may be trimmed off when not needed. However, where more than four charts are fastened together, the margin may be used as an overlap which can be sewed to the charts. Sewing machines are used by most Ohio Power Co divisions to sew their charts together in order to facilitate analyzing the charts.

CHECKING OVEN for thermocouple-type appliance oven testers reduces testing time. Temperature rise on outer surface is negligible; power needs are low. Major cost was time required to build oven. Here author is checking oven



OVEN DETAILS show 12 to 1 ratio of heating element length to diameter to give uniform temperature at center of oven. No 25 Nichrome wire element of 95 ohms is space wound on Pyrex tube with final coat of Insulite to hold wire in place

Low-Cost Oven Cuts Tester Checking Time

WM. H. BLAIR
Meter Laboratory
Potomac Electric Power Co
Washington, D. C.

Here is an oven that has given excellent performance in checking thermocouple-type oven testers submitted by our Appliance Service Division and Home Service Bureau. It has eliminated the cumbersome setup previously used and its cost was negligible. Man-hours required for construction was the major cost. Checking time has been reduced.

After the equipment is set up and the test is underway, a minimum of the technician's time is required for subsequent operations. Because he may take readings after random-length time intervals, and only a minute or so is required to read the instruments and adjust the voltage for the next temperature level, the technician normally can perform this test concurrently with other tests.

Power of 4 w at 20 v will provide approximately 250 F while 20 w at 45 v will give about 600 F. Temperature rise on the outer surface of the oven is insignificant. This factor alone is of appreciable merit.

Normally, the reference instrument is an oven tester similar to those being tested—one which has been carefully standardized for this application. Standardization of this reference instrument, or a check on its previous calibration, is accomplished by including an extra thermocouple with those being tested and reading its emf on a potentiometer.

To check several oven testers, their thermocouples and that of the reference instrument are carefully bound together (just back of the thermocouple junctions) with a piece of asbestos string. Several turns of string are wound turn-on-top-of-turn to provide a means of centering the junctions axially in the tube. Also, junctions should be centered longitudinally. To close the two oven openings, asbestos string is again used. Where thermocouple leads enter the oven, string is wound around them until the opening is closed.

The oven and a voltmeter are connected to the output of a Variac and the voltage adjusted to give an oven temperature approximating that of the check point involved. A simple voltage-temperature table is very helpful in setting the voltage for a given temperature level. Following the application of a voltage, or a change in the voltage from a previous check-point level, thermocouple emf will be changing quite rapidly. About 10 to 15 min may have to elapse before an accurate comparison can be made between the instruments being tested and the reference.

Why don't you do something about Scrap Copper?

A group of us were sitting around the lunch table the other day when Bill Kerr, the President of our Company, brought up the subject of scrap copper. He asked why something wasn't being done about promoting a nation-wide drive for scrap copper. It was his opinion that the shortage of scrap copper is as severe, and possibly even more severe, than the shortage of scrap steel.

That, of course, started a very lively discussion, and in the end we all agreed on one thing — that in the face of a severe copper shortage, plenty of good copper was lying around just waiting to be put back into use.

Joe, the "wag" of our luncheon group, quipped: "Old copper never dies — and it doesn't rust away!" "Hold on, Joe," said one of the other fellows. "There's more truth than poetry in that statement. Did you ever stop to think that just about *all* of the copper that has ever been mined is still around somewhere? It can be found in hundreds of places — in factories, old mines, and especially in shop maintenance departments where old and outmoded spare equipment containing large amounts of copper is stored away. All this scrap copper can be turned back into good, usable copper, which is so desperately needed today."

Well, our conversation resulted in something real and concrete. We launched a "Scrap Copper Drive" right in our own Company and, believe it or not, we found 39 tons of old copper. A lot of it was copper wiring that was abandoned at the time we rewired our plant a few years ago. We even reclaimed copper from an odd assortment of obsolete castings and fittings that was being "saved" for no apparent good reason.

That copper is being sold to a dealer in non-ferrous scrap metal who, in turn, will direct it to a copper company for processing into wire, bus bars, and other vital shapes.

THAT'S WHAT HAPPENED. We're telling you about it because we believe the subject of Scrap Copper is so important, it has priority over the transformer advertisement that was scheduled for this issue.

May we suggest that *you* get together with the people in your company and talk about "Scrap Copper." Then, *do something about it!*

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • *Greater Pittsburgh District*

The independent consulting engineering organization is Management's most helpful ally in working out modernization programs, new plant designs, expansions, and related projects.

Management's utilization of the skill and know-how of technically trained experts in architectural, civil, chemical, electrical, and mechanical engineering clearly indicates the trend in progressive thinking in relation to present and future problems.

The Peter F. Loftus Corporation through the years has cooperated with the management and engineering staffs of many utilities, industrials, institutions, and governmental agencies.

Peter F. Loftus Corporation
Established 1930

ENGINEERING CONSULTANTS
First National Bank Building, Pittsburgh 22, Pennsylvania

Use Liquid and Steel Wool To Clean Cooling Coils

S. H. THOMPSON
Substation Maintenance Foreman
Beech Bottom Power Co
Power, West Virginia

Several methods and accompanying precautions for cleaning the cooling coils of large water-cooled transformers at the Windsor generating station are outlined below. A gelatinous iron precipitate is the deposit to be removed. Originally a caustic-soda solution was applied by a high-pressure steam jenny to clean the external coil surfaces. This was effective in removing the oil sludges and carbon deposits but involved considerable hazard as the operator had to be protected from caustic burns and wind-borne vapor endangered anyone within fifty yards.

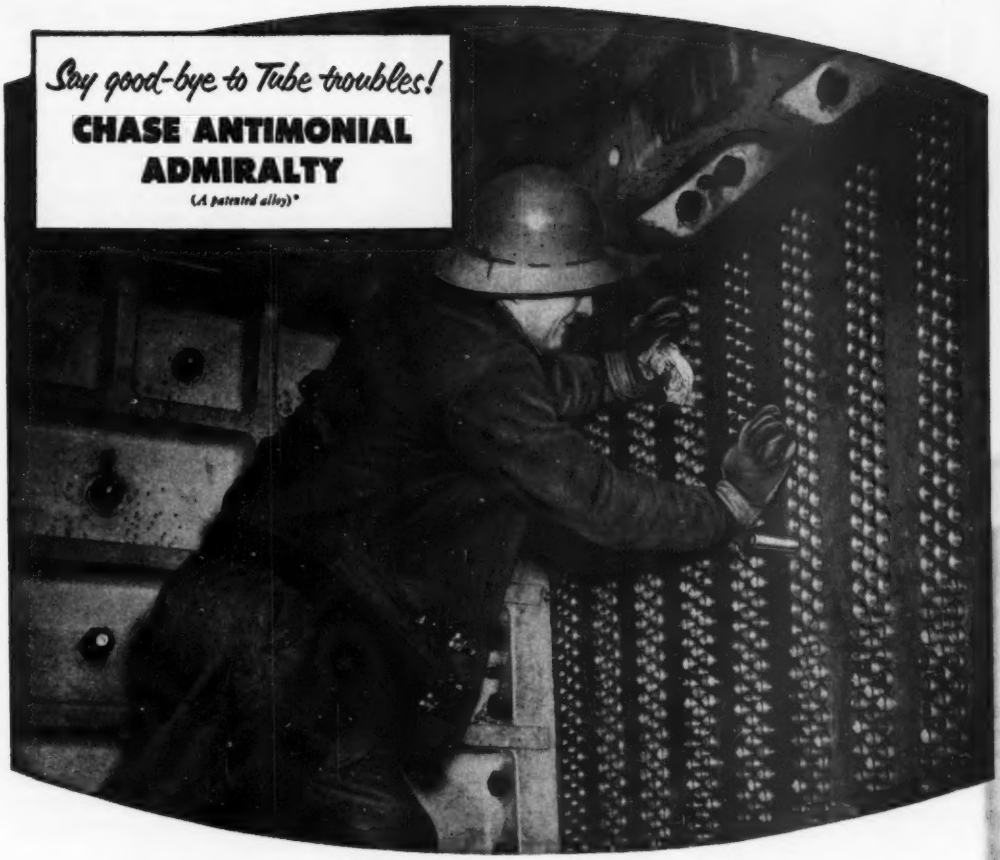
Next a proprietary cleaning solution was used that did a very good job in the steam jenny. However, it was corrosive. This solution required protective clothing for the operator and prevented other work in the vicinity. A well known paint-and-varnish remover was also tried in combination with steel wool. While the material was effective and did not produce a corrosive vapor, it still presented a hazard.

Satisfactory Solution Found

Recently, we began using Penetone Senior, a proprietary liquid. Mixed with nine parts of water and applied with No 2/0 steel wool, it removes the carbon and sludge very effectively. It is non-corrosive and no hazard is involved in its use. After cleaning it is necessary only to rinse off the cleaning material and steel particles with water.

Cleaning the water side or interior of the coils presents a different problem. Here mineral deposits and scale must be removed, instead of carbon and sludge. For this operation a muriatic-acid solution (five parts water and one part acid) is pumped through the coils at about 20 gal per min for two hours. A 20 gpm pump especially built to handle acid solutions is used. After the acid wash, the coils are flushed out throughly with water and blown out with compressed air until thoroughly dry.

Present methods are the most effective and safest of any we have used to date. However, certain precautions are necessary. Care should be taken that no particles of steel wool remain on the coils or get into the transformer



LONG-LASTING because there's enough antimony to resist dezincification.

LONG-LASTING because antimony doesn't affect the grain structure of the metal—won't weaken the tube.

LONG-LASTING because years of tests and actual use of Chase Antimonial Admiralty have proved that the right amount of antimony increases the life of the tube.

Send coupon for Free Book on Condenser and Heat Exchanger Tubes.

CHASE WAREHOUSE STOCKS: *NEW YORK, BALTIMORE, NEW ORLEANS, LOS ANGELES,* also carried by—*Vinson Supply Co., Tulsa; Standard Brass & Mfg. Co., Houston.* *U.S. Pat. No. 2,061,921

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

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CHASE 75th ANNIVERSARY 1876 - 1951

FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

Chase Brass & Copper Co., Dept. EW1151
Waterbury 20, Conn.

Please send me Free Book on Condenser and Heat Exchanger Tubes.

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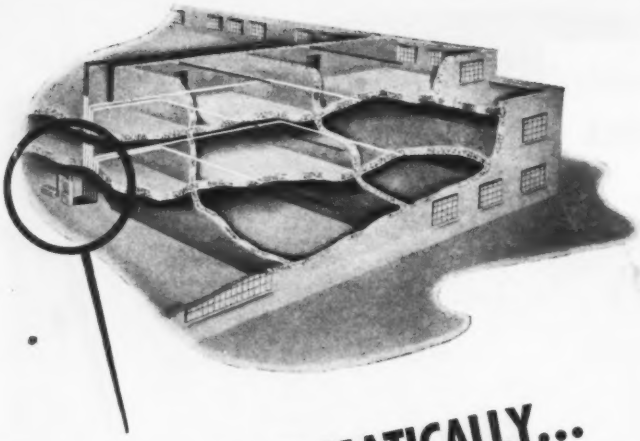


DETECTS AUTOMATICALLY... SMOKE, SMOLDERING AND FIRE

at any location in your plant or warehouse!

Each fire hazard point gets highly efficient, round-the-clock fire watchman service simultaneously when a building is completely protected with a modern, fully approved C-O-TWO Automatic Smoke Detecting System.

The first whiff of smoke sets off an alarm, based on an exclusive operating principle . . . no chance of smoke, smoldering or fire spreading . . . instantly, the air conditioning shuts down, doors and dampers close, operating equipment stops and fire extinguishing systems actuate . . . a truly automatic fire watchman.

Four types of smoke detectors and several different installation arrangements are available to fit your particular needs...single space systems, double space systems, multiple space systems, air conditioning duct systems . . . all function by drawing continuous air samples through simple piping to a smoke detector.

Actual fire tests made by the Underwriters' Laboratories, Inc. show that fire detection with this type of smoke detecting equipment is much quicker than other methods . . . because usually there is smoke or smoldering before flames break out.

Remember fire doesn't wait . . . so, with current expensive delayed replacements, why not let an expert C-O-TWO Fire Protection Engineer help you now in planning economical, fully approved fire protection facilities. Write today for complete free information.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

tank where they would be carried around by the oil. Being both magnetic and conductive, they would probably congregate where there is high magnetic or dielectric stress and cause a very dangerous condition.

The acid solution used for cleaning the interior of the coils should have an inhibitor added to prevent corrosion of the metal. The inhibitor that we use is Nep No 22. In all acid cleaning we use 1 part inhibitor to 50 parts acid, regardless of the strength of solution used.

Penetone Senior solution and No 2/0 steel wool also clean dirty insulators and bushings very well. After cleaning, any residue should be washed off with clear water. The manufacturer claims the material is non-toxic and non-inflammable.

Guy-wire Holder Serves As Safe Pay-out Reel

JESSE L. WILLIAMSON
Kentucky and West Virginia Power Co
Pikeville, Kentucky

One effective way of restraining a coil of guy wire and of providing a safe unattended pay-out "reel" is to use a holder made from a worn-out automobile tire. Such devices have been used with satisfaction in the Pikeville District. Each line crew is using one or more of the guy-wire holders and finds them safe, convenient and economical.

This type of holder utilizes throw-away tires and requires less than one hour labor for making each tire into

GUY-WIRE HOLDER is made from old automobile tire which has gaps cut down to the bead. One bead is cut to facilitate inserting coil but is joinable by a connector

When it comes to fluorescent lamp brands here's the brand of quality

All fluorescent lamps look alike. But all do not light alike, or last alike. Westinghouse fluorescent lamps are unsurpassed in giving long-life, top-quality performance. This long-time service means savings in lamp replacements and lamp replacement time. So, whether you're lighting a roundhouse or ranch house, specify Westinghouse; there's no better value for your money.

YOU CAN BE SURE...IF IT'S Westinghouse

Ann
Curry comb
Crosby
Seven Up
Bob on the Square
Turkey-track

Lamp Division,
Westinghouse Electric Corp.
Bloomfield, N. J.

Send me more information on how I can save with Westinghouse fluorescent lamps.

NAME..... TITLE.....
COMPANY.....
STREET.....
CITY..... ZONE..... STATE..... EW

CRESCENT
Makes A Complete Line Of
ELECTRICAL WIRES & CABLES

SYNTHOL Building Wires, Type TW

ENDURITE Building Wires
Type RH-75°C or RW-60°C

A B C Armored Cable

Service Cable, Types SE-U; SE-A; SD

IMPERIAL Neoprene
Portable Cords & Cables

Parkway Cables, All Types

Varnished Cambric Cables

CRESCENT
WIRE AND CABLE
OVER 60 YEARS EXPERIENCE
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON N. J.

a holder; can be rolled while loaded with coil weighing as much as 200 lb, or lifted by adequate number of men; prevents guy-wire from flying loose; and is suitable for all sizes of guy-wire. Unused portions of a coil or salvaged lengths can be easily recoiled in the casing.

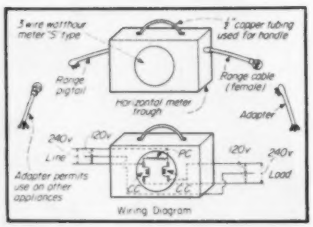
Holder to accommodate 28-in. coil of 500 ft of any size wire was made from a worn-out 6:00 x 16 passenger-car tire. Casing has gaps cut down to the bead to decrease weight. Bead is cut on one side to facilitate inserting and removing coils. Badly worn tires permit easy handling of wire.

To load the coil, the casing is laid flat with the cut bead uppermost and nearest the user so the coil can be slid into place. Then the cut bead is joined by a simple fastener (not shown). With the coil thus restrained, the seizings are removed. The guy-wire is drawn out through the central opening of the casing while laid flat with uncut bead uppermost. To remove a coil, the seizings are reapplied and the casing "peeled" off as shown in the illustration.

Check Appliance Use With Light-Weight Kit

J. VERNON WENTWORTH
Athol Gas & Electric Co
Athol, Mass.

Energy consumption and demands are readily measured on electric ranges and other appliances by the portable kit developed by this company. Its weight is about 20 lb and



TEST KIT and connection arrangements speed field checks on energy consumption and demand of electric ranges

it measures 7 x 11 in. A 3-wire watthour meter is mounted inside a horizontal meter trough. The outfit is provided with range cable and pigtail connections as shown. An adapter is provided to permit use on other appliances. Room exists for application of a demand register.

IT'S NEW!

the answer to your interrupting problems

*Available with

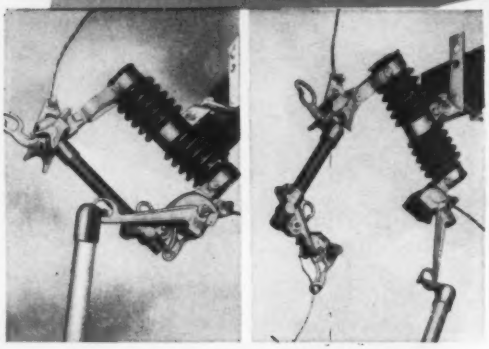
the new CHANCE K0 Cutout...

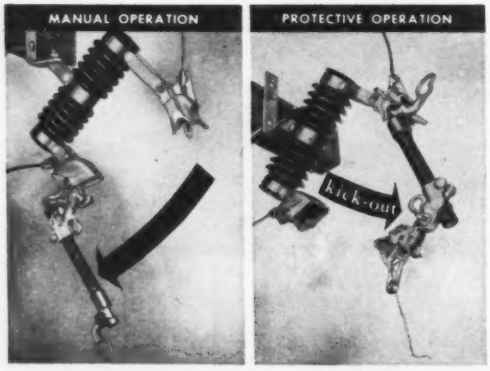
See Next Page

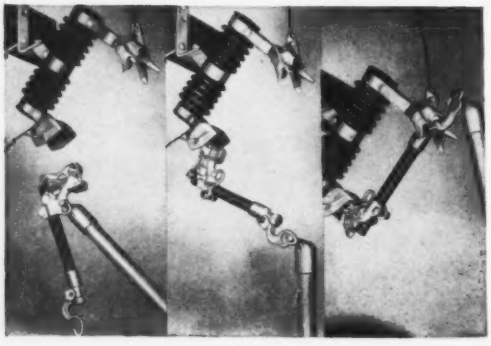
NOW...the combination you've asked for...

LOAD BREAK OPERATION *plus*

OVERALL PROTECTION...in the new CHANCE KO Cutout







C51-4

Breaks charging, magnetizing and load currents —manually

The new KO cutout is now available with a *load break* lever for interrupting line charging currents, capacitor bank circuits, loop or radial circuits and single or three phase transformer magnetizing or load currents without the aid of reclosers, circuit breakers or expensive load break equipment. By pulling the load break lever, the circuit is interrupted *inside* the fuse tube, in the same manner as when the fuse is blown by an overload or fault. Photo at left shows the simplicity of operation. The delayed Kick-Out prevents contact pitting.

Exclusive Kick-Out operation—gives you these advantages

The exclusive CHANCE "kick-out" operation gives a *positive* indication to trouble shooters that the cutout has been opened manually or by a protective operation, thus saving costly patrolling time. The Kick-Out method of operation has the advantage of mechanical time delayed separation of contacts not possible in gravity operated cutouts. Link ejection is completed and arc extinguished in tube before contacts part. This prevents pitting and burning of contacts, eliminates contact maintenance and reduces radio and television interference.

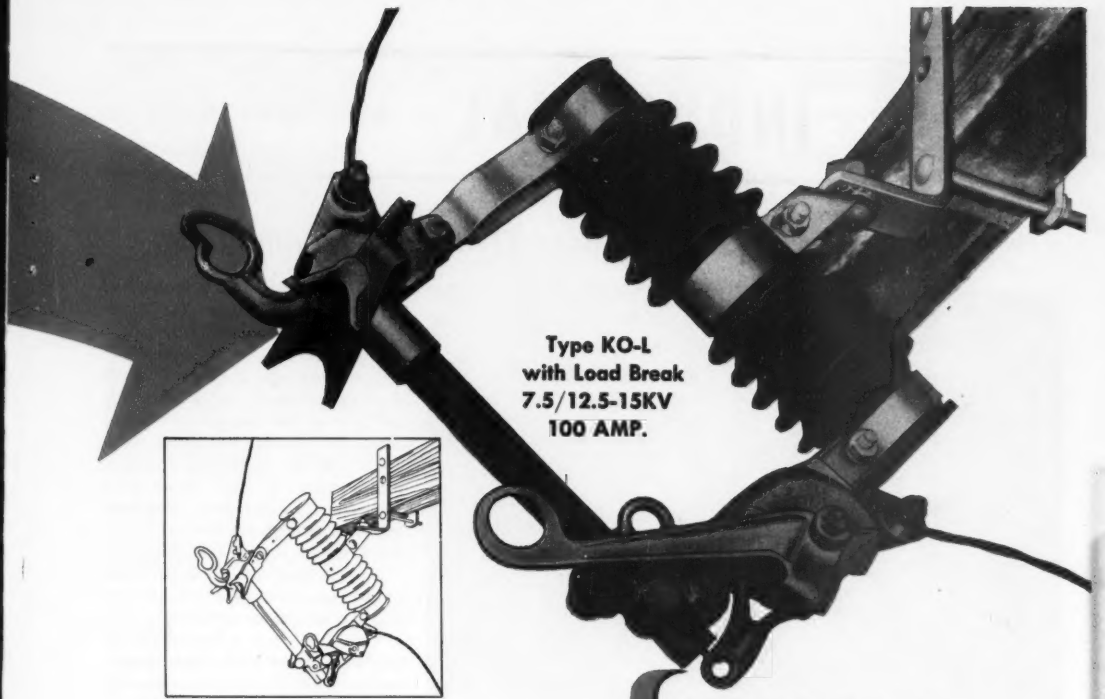
Easy to Re-Fuse with a Hook Stick

Chance KO Cutouts with or without the load break lever are easily reloaded. The tube is released by a pry-out lever. The KO design prevents any shock or strain on the fuse link when closing the cutout after re-fusing. This prevents damage or breakage of the link. Long guides aid the operator in closing the cutout from any angle. When the cutout is closed-in on a fault, expulsion gases are directed away from the operator.

Overall Protection from Light Overloads to Heavy Fault Currents

Thousands of successful field tests* prove superior performance from 1 amp to above 3500 RMS amps at power factors of less than 20%—your assurance of positive protection from light overloads to heavy fault currents.

*Tests made by Chance Mobile Lab on utility systems.



Type KO-L
with Load Break
7.5/12.5-15KV
100 AMP.

Type KO (Conventional)
Same heavy construction as KO-L

Only CHANCE gives you all these features

... make your own comparison with any other cutout

Compare the Chance KO with any other cutout ... compare it electrically—compare it mechanically—test it for high or low current operation... you'll find that these CHANCE features add up to economical, safe, always reliable operation.

Order through your electrical supplier—specify CHANCE—KO or KO-L.

1 ***LOAD BREAK*** **device, optional.**
2 ***Overall Protection*****—Proved by thousands of tests.**
3 ***Pry-Out Lever*** **for easy opening and closing. Allows the use of heavy duty contact springs without requiring extra effort to remove tube.**
4 ***Exclusive Ejector Mechanism*** **provides fast complete ejection of fuse link before contacts part—even on a low current interruption.**
5 ***Sleet Shields for All-weather Operation.*** **Protect contacts and operating mechanism and prevent water from entering the tube to cause twisting and swelling of the fiber.**
6 ***Mechanical Time-Delayed Contact Separation.*** **Prevents pitting or burning of contacts.**
7 ***Pivot Bracket*** **(E.E.I.—NEMA) for cross-arm mounting. A special bracket is available for pole mounting.**
8 ***Positive Semaphore Indication*** **to show if cutout was opened manually or by a protective operation.**
9 ***Easy Reloading*****—simple hook stick operation from any angle.**
10 ***Link Element Protection*****—Link tension not affected by closing action. Eliminates breakage or damage to time-current characteristics of link.**
11 ***Overtravel Stops*****—Protect pressure contact springs.**
12 ***Safety to Operator*****—Tube angle directs expulsion gases away from lineman when operating cutout.**

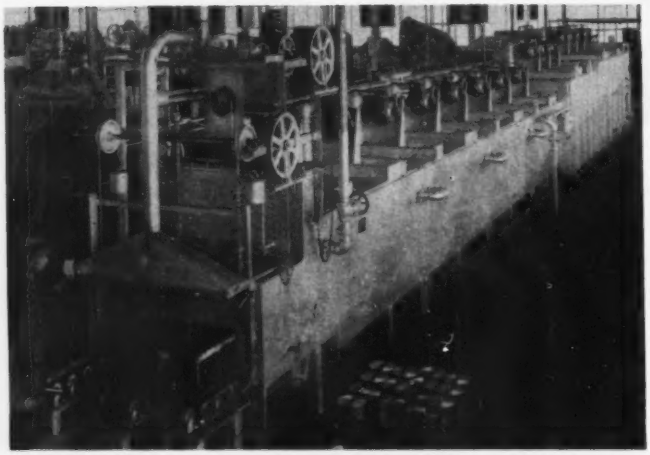
ABC INDUSTRIES

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

Electric Annealing Furnace Eliminates Cleaning



COPPER ANNEALING in electric furnace eliminates pickling with large savings. Grain size and ductility are very uniform throughout coil. Handling labor is cut since loading and unloading is at same point. Furnace capacity is 4000 lb per hr

C. E. PECK, Manager
Industrial Heating Engineering
Westinghouse Electric Corp
Meadville, Pa.

The copper annealing furnace at the Harrison Radiator Division of General Motors, Lockport, N. Y., turns out dry high brightness copper which does not need any further cleaning or pickling. This has resulted in large savings compared to older annealing process where pickling was necessary. The product is very uniform throughout as to grain size, ductility, etc. Material flow through the furnace requires a minimum of labor for handling since loading and unloading is at the same point. This electric furnace is used to bright anneal copper strip of a variety of widths and gauges. It is designated as a return recuperative pusher type.

Furnace capacity is 4000 lb per hr. Coiled strip is carried on alloy steel trays and the loads vary up to a maximum 1000 lb per tray. Furnace is arranged so that work is loaded and unloaded at one location. The incoming trays and outgoing trays travel through the furnace in opposite directions and are transferred across from the incoming row to the outgoing row at the end of the heating zone. This arrangement allows recovery of 20-25% of the heat in the annealed copper to cold copper going toward the annealing zone. The pushing cycle through the furnace is automatic, using a timed sequence control.

Purging chambers and inside doors to form gas atmosphere locks are built into the furnace at the charging end in order to insure a high degree of purity of furnace atmosphere throughout the inside of the furnace structure which in itself is welded gas tight.

The furnace is rated 125 kw, 220 v, 3 phase, 60 cycle and average operating temperature is 1050 F.

The heat recuperation associated with preheating ingoing copper and the cooling of the outgoing copper is accomplished by a series of recirculating fans and tubular cooler located in the top of the furnace.

The gas atmosphere is produced from controlled combustion of manufactured gas to produce a gas with a low hydrogen content of one percent or less. The low hydrogen content is necessary to prevent embrittlement of copper during the anneal. Sulphur removal equipment is also added.

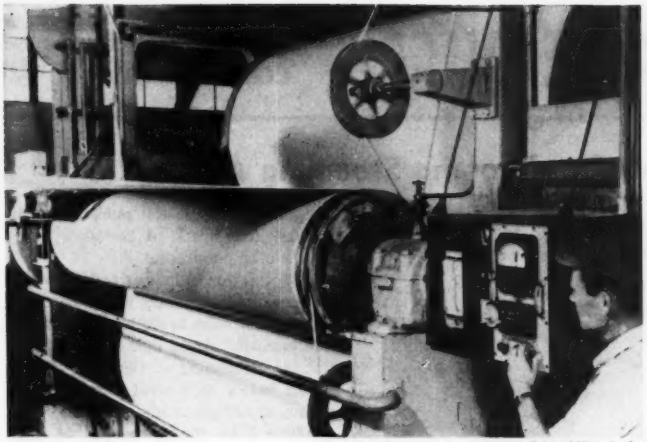
Beta-Ray Gage Improves Paperboard Accuracy

Said to be the first installation of its kind, a beta-ray gage is used at the Antioch, California, plant of the Fibreboard Products Corp to help maintain accurate and uniform weight of milk carton paperboard.

The gage, mounted on one of the company's 136-in. paperboard machines, records the varying amounts of beta-rays absorbed by the board as it passes through the gage head of the non-contacting device. The amount of beta-rays absorbed varies with the weight of the board, thus allowing a constant check to be maintained. Variations as slight as one per cent from the desired weight per unit area of the board are automatically indicated and recorded for the operator's information.

Operators are able to make adjustments of the processing machinery as needed to produce paperboard of uniform weight. This is particularly important in the case of milk carton board and similar material that is run through folding machines which are set to operate on extremely close tolerances.

According to E. H. Entricken, in charge of instruments at the fibreboard plant, the beta-ray gage is "more than a watchdog to prevent bad runs



General Electric Co

ACCURATE WEIGHT of milk carton paperboard is maintained with aid of beta-ray gage. Variations as slight as one per cent from desired weight are automatically indicated and recorded. Operators can make adjustments of processing machinery quickly and without much loss of product whenever weight goes beyond desired limits

—it also aids in setting up new runs more quickly."

The gage, which is not affected by the speed, consistency, or temperature of the material being measured, may also be applied to plastics, rubber, metals, and special sheet materials where a continuous indication is desired. Since no part of the gage is in actual contact with the material being measured, it leaves no mark or scratch.

Electric Steam-Jet Cuts Cleaning Costs

Livingstone Engineering Co

MACHINE PRESSES are completely cleaned in ¾ hr at a total cost of less than $2.00 each, by the use of an electrically heated steam jet cleaner at the Rockwood Sprinkler Co, Worcester, Mass. The cost is far below the formerly used ordinary scrub brush methods. There are no fumes, no fire hazard, and no rusting. Odd parts are frequently brought in to be cleaned thoroughly. Connected load is 30 kw

INDUSTRIAL BRIEFS

Cleaning conveyor hangers is aided by electric strip heaters in a paint stripping tank at Western Metal Specialty Co, Milwaukee, Wisc. After a few days' operation, the hangers become covered with 300-400 coats of paint which are removed by placing them in an electrically heated alkali cleaning tank. Tank measures 2½ x 2½ x 1½ ft, is covered with 2 in. of insulation, and heated to boiling by 12 1250-w strip heaters clamped to the side of the tank. After solution is up to temperature, the two top rows of heaters are turned off leaving only lower row of four heaters which holds solution at the required temperature.

Automobile servicing jobs completed are increased 30% and at least 20 manhours in mechanic's time are saved daily at Harvey Golden, Inc, Reading, Pa, Oldsmobile Sales and Service by installation of an electronic service control system. Lost motion between jobs is eliminated, and employee's morale and interest in the work is boosted. A "control tower" operator is in complete control of every servicing and repair job through an intercommunicating sound system control panel and Job Recording Board. All work is scheduled and progress followed without necessity of mechanics leaving their station. A large electric Job Indicator Board in the shop enables service salesmen to determine quickly the number of major jobs that can be handled. Harvey Golden, president, estimates system paid for itself in less than 2 yrs.

High Bay Lighting with reflector lamps was installed at nominal cost with economical operation on standard voltage and low maintenance at the Specialty Steel Products, Inc, Braddock, Pa. Company officials are well pleased with installation, since lamp cleaning is unnecessary and only maintenance required is burned-out lamp replacement. Intensity is approximately 23 ft-c uniformly distributed throughout the 40 by 120 ft shop. Installation has ten 750-w reflector lamps on 20 by 15 ft centers, mounted 30 ft above floor. A. M. Langord, Industrial Representative, Duquesne Light Company, Pittsburgh.

SALES AND SERVICE

RESIDENTIAL • RURAL COMMERCIAL

Home Lighting Conditioning Steaming Ahead

By the end of the year there will have been put on exhibit no less than 400 local utility sponsored "Light Conditioned" homes in which as many as possible of the General Electric lighting recipes will have been employed. These 400 represent definite commitments by electric utilities.

By the end of the year there will be between 175 and 200 electric utilities which will be participating in the program. This participation will range from the distribution of the "See Your Home In A New Light" booklet to the sponsoring of demonstration homes. In between these extremes there will be such activities as discount sales of recipe equipment to employees . . . door-to-door demonstrations by home lighting counsellors . . . home lighting clinics and demonstrations to consumers . . . local advertising of the program and recipe merchandise.

PEEKING INTO KITCHEN, visitors learn about the importance of lighting in the workshop of the home

Nela Park people estimate there will be close to 2,000,000 of their home light conditioning recipe booklets distributed by the end of the year. This represents the greatest public interest in any one piece of literature they have ever published.

Spot research indicates that every electric utility which has sponsored a demonstration home has been more enthusiastic about light conditioning at the conclusion of the open house than before they went into it. The glamour of light conditioning has been indicated by the attendance at the various showings. They have ranged from a fabulous 50,000 in Cincinnati to averages of over 5,000 in smaller communities such as Newark, Ohio, and Dubuque, Iowa.

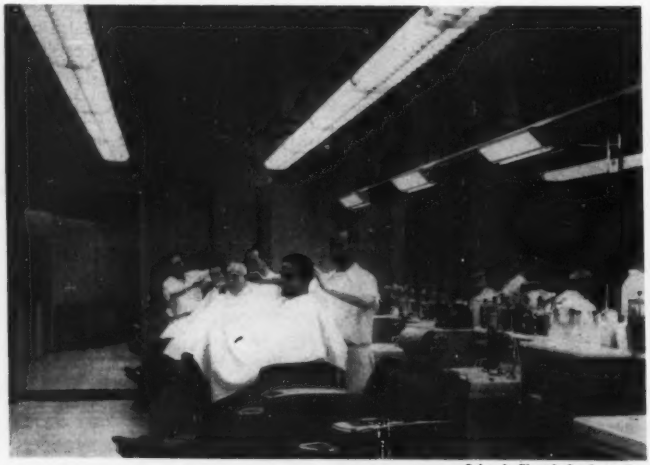
In a catalog that GE has prepared for internal use among its marketing people, there are listed more than 20 fixture manufactures with lines made specifically to meet lighting recipes. In the portable lamp field the figure is even more encouraging with upwards of 35 manufacturers showing models for the home lighting conditioning program.

The enthusiasm of builders who have participated in light conditioned homes has been unanimous. Now for the first time in years they have something new to talk about and sell. Here is what one well known Long Island builder wrote after demonstrating his first Light Conditioned home, "I am not trying to sell houses today, I am selling lighting, and the response from the home buying public is sensational." Observers report that the enthusiasm on the part of the builders in demonstration cities has been particularly noticable among the competitors. Often before the host builder has had a chance to analyze his future activities, news comes of his competitors ordering and installing recipe fixtures in their neighboring houses.

While the program has been justly held back so the major attention can be given to vitally important mobilization work, everyone connected with the activity is enthusiastic about its acceptance by the utility, the fixture and portable lamp manufacturers, re-

(*Continued on page 169*)

Barber Shop Lighting Solution



Sylvania Electric Products, Inc

PROBLEM was to light to high intensity a barber shop located in a corner of a hotel lobby, using no more than two ceiling attachments and avoiding any considerable spill of light into the lobby. The picture shows the solution. Two rods from the ceiling hold up the ends of a pair of cross members whose other ends are attached to the wall. On the cross members are hung two continuous rows of fixtures. The fixtures are closed at the top, preventing any direct light upward. Intensity of about 60 ft-c is maintained at the chairs

HI-TENSION NEWS *Junior*

Never a worry— for 30 years!

This line and station are both about to round out their 30th year with the original O-B insulation—and, today, both are part of the main power supply for an important eastern industrial city. A prime operating essential is reliability, and the O-B insulators are delivering it as faithfully as the day they were first installed . . . Little wonder many a subsequent line owned by this power company has been fully O-B - equipped . . . If you, too, want to have insulator worries off your mind for probably the rest of your professional career, specify O-B!

Ohio Brass

MANSFIELD, OHIO, U.S.A.

OB

HI-TENSION NEWS *Junior*

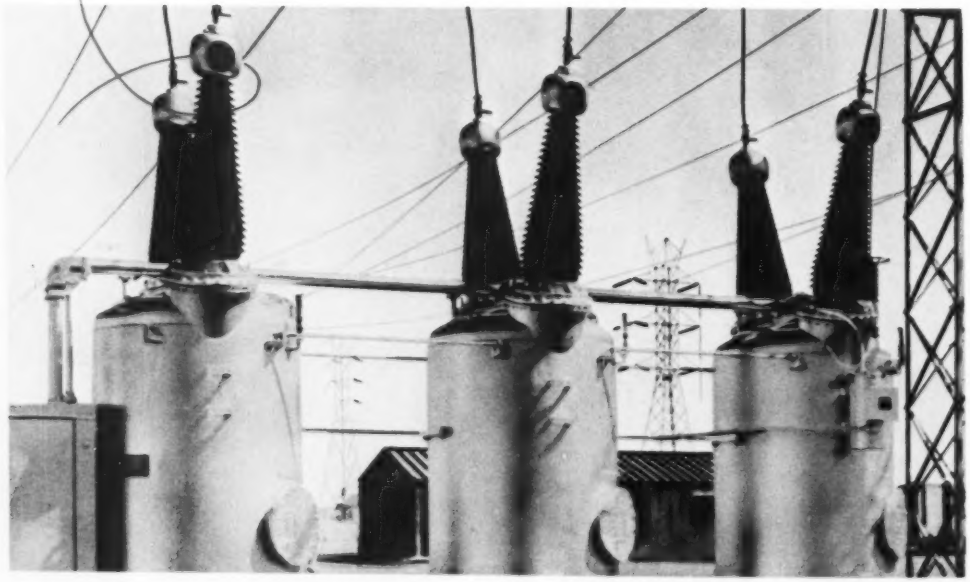
OHIO BRASS COMPANY
Barberton Division • Barberton, Ohio, U. S. A.

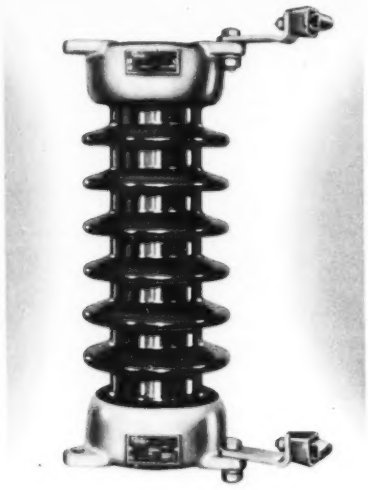
TO: PACIFIC ELECTRIC MFG. CORPORATION

One of many three-phase reclosing oil circuit breakers supplied to a large western system by the Pacific Electric Mfg. Corporation. According to its builder . . . "This breaker is designed for operation on 230-kv lines. It carries 1200 amperes continuously, and is available with interrupting ratings of 5-, 7.5-, and 10-million kva. Interrupting time is 3 cycles, closing time is 10 cycles, and reclosing minimum time is 20 cycles standard, though 15 cycles may be had if ordered. Sliding-shoe contacts require no critical adjustment to fix closed position, nor is contact pressure affected by contact wear. Other Pacific Electric features include closing by stored energy of motor-compressed springs, improved arc extinguishment." And . . .

O·B BUSHINGS

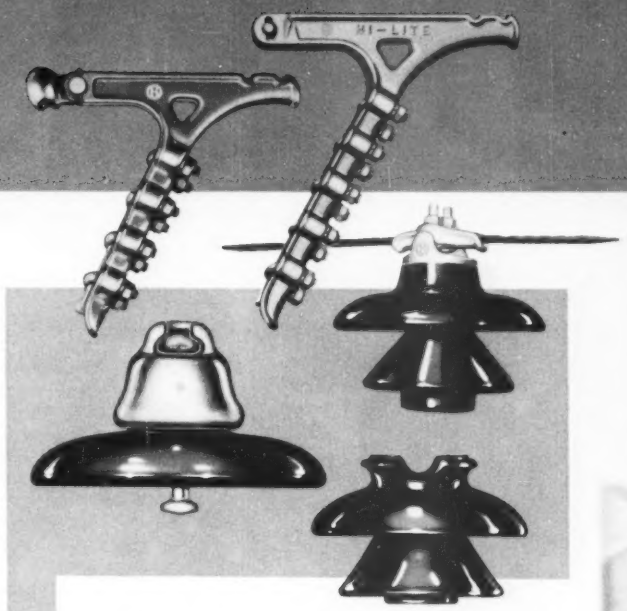
One of the Finest Components of Any Circuit Breaker





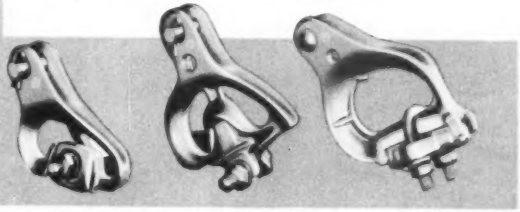
How do you *"Rate"* a Lightning Arrester?

When you look up a lightning arrester in a catalog, what does that catalog tell you? It first lists "Average Protective Rating" whose low level is important, but how low *does it stay* when you have applied "Tolerance?" These two factors, taken together, define a maximum protective level which is the true gauge of arrester performance . . . When you rate arresters on the basis of maximum protective levels, you will begin to appreciate the O-B Thorex. To already low average ratings are applied exceptional protective tolerances: +10 per cent sparkover and +5 per cent IR discharge voltage, resulting in a correspondingly low maximum and, accordingly, high protective performance . . . This property of O-B Thorex arresters deserves careful, critical examination. Have you investigated their possibilities?



One thing "NO OTHER" Company Can Supply You

In the entire electrical industry, O-B is the only supplier of insulators and hardware that produces both classes of material "under the same roof." One group of engineers, one laboratory, one production force deal with what is fundamentally *one problem*; that of supporting a power conductor. There's no temptation to make a certain product look good at the other's expense. There's no room to pass the buck . . . and it works in reverse, also. If either part is deficient, the other comes down with it! . . . This single responsibility —this business of men working together making parts that must work together—has produced some of the longest-lived, trouble-free lines in the industry. Holding up a power cable is, after all, *one job* and it's a smart move to give it to one manufacturer. O-B is unique in being the only supplier to offer such a logical service.



Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

...and one to grow on

Since the growth of power requirements points to the certainty of higher primary voltages, you can forestall the expense and difficulty of revising dead-ends at some later date by specifying *two* O-B six-inch insulators at all deadend points—now! The second insulator installed *at the time of original construction* will accommodate future load growth by preparing lines for any voltage required later—up to and including 15 kv.

Ohio Brass

MANSFIELD · OHIO

4144-H

Lighting Conditioning

(*Continued from page* 164)

tailers and the builders, the local and national press, and of most importance—the public.

• Plans for an electric bedding campaign to be conducted from Nov 11 to Dec 15 have been announced by the Chicago Electric Association. It will be supported by a $50,000 promotion and advertising program which will feature the slogan "4 million people sleep under electric blankets. Why don't you?" Ads will carry out the Christmas gift theme. They will be carried on billboards, car cards, and in the newspapers. Cash prizes of $50 to $100 will be awarded five dealers winning a window contest.

• Refrigerators have now been added to Perfection Stove Company's line of electrical products—two models of 9 and 10 cu ft. The larger has a freezer chest of 70-lb capacity, two crisper pans, and a dry storage compartment. Freezer capacity of the smaller is 52 lbs. All of Perfection's warehouses are stocked and shipments to dealers are being made.

• "Drying Forage by Forced Ventilation" is the title of a recent U.S.D.A. publication that farm service representatives should find extremely useful. It covers types of driers, construction details, use of supplemental heat, quality of forage, etc. Write to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. and ask for Farmers Bulletin No. 2028. Price is 10¢.

• Appliance dealers in New Orleans are informed of their sales opportunities by a market potential study recently completed and distributed by New Orleans Public Service, Inc. The study was based on a sampling consisting of approximately 4300 personal interviews with residential customers of the utility. Data are presented by income classes and show 1950 saturations of individual appliances as compared with 1948 when the first such study was made. The point is made that for the most part appliances will be plentiful in 1951 and hard selling will be needed.

SERVICE LIGHTS ARE NOT NEEDED for under hood or auto work in this Spokane auto shop which has 60-ft-c illumination level

Good Lighting Ousts Service Lights

ALEC B. GODFREY
Commercial Representative
Washington Water Power Co, Spokane

Service lights are seldom necessary, even for work under the hood or under the car, with a general illumination level of 60 ft-c in shops of the Utter Motor Co, Spokane. Combination of four tube and two tube fluorescent units ceiling-mounted has proved

Engrave
PANELS UP TO 25" WIDE IN YOUR OWN SHOP WITH THE NEW ENGRAVOGRAPH
Portable Model 1-S

- The *only* portable machine which reproduces *15* sizes from one master alphabet.
- The *only* one with *adjustable* copy holding slides for multiline engraving in one set-up.
- Self-centering holding vise for nameplates and dials.

Send for Booklets
I-S 48—portable model
H-48—heavy duty model

new hermes
Engravograph
NEW HERMES, Inc.
13-19 University Place, N.Y.3, N.Y.
CANADA 359 St James St. Montreal
World's Largest Manufacturer of Portable Engraving Machines

produced · treated · sold by

J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

Double-Life *Western Larch Poles*

J N *J. Neils Lumber Company*

Pole Division: LIBBY, MONTANA

most satisfactory, with a noticeable increase in employee morale since their installation.

Fixtures are arranged parallel to the working stalls and hoists, with a row of two fixtures on each side of each car. The center line forms a path to lead the customer through the shop. Continuous rows of industrial units mounted along the edges of the long work benches at the side of the shop provide 80 ft-c for fine detail work.

• Theme of Westinghouse fall range promotion which began October 5 is speed, timed with a stopwatch to prove that the heating unit gets to red heat in 30 seconds. This idea is incorporated in an animated floor and window display piece for which 4500 stopwatches were ordered from Switzerland, no American maker being able to fill the order in time.

• Exclusive use of the Apex dishwasher in its packaged kitchen installations has been decided on by the Crane Company.

• Now in progress—September 17 to December 15—is the "Touchdown" range sales campaign of the Pennsylvania Power & Light Co. The "Touchdown" gimmick is a drawing by which 150 range buyers will each win $100 in credit toward purchase of a water heater, home freezer or laundry dryer, plus $50 donated in the names of winners to charitable or other worthy organizations. The company pays the dealer $50 in cash as its share when the credit is used and pays also the $50 donation.

• Two new refrigerators have been added to the Frigidaire line. One is a deluxe model, all-porcelain finished, of 9 cu ft capacity. The other is a standard with 9.2 cu ft of storage space.

• Utility lighting engineers who contact architects should be on the watch for Westinghouse's "Lighting at Work" show, now touring the country. The show has the nod from the AIA which observed "that it is of value and interest to the architectural profession." Expertly presented by Westinghouse engineers Bill Kahler and Sam Davies, the show is well staged and holds audience attention. Utility men should see that their architect and consulting engineer friends are invited to it.

FACT:

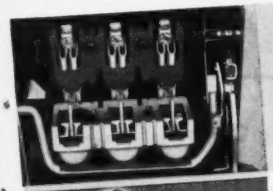
Square D Type A Safety Switches are the overwhelming first choice of industry

REASON:

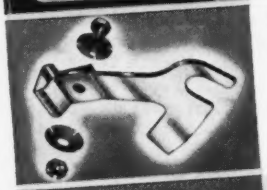
DESIGN LEADERSHIP

PROOF:

a feature-by-feature comparison

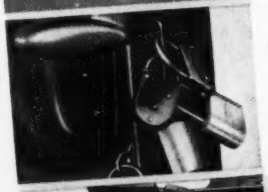


Magnetic Arc Suppressors
"blow out" the arc, contribute to exceptionally high interrupting capacity.

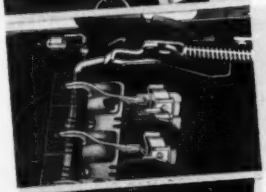


Spring-Loaded Blade Hinges
for pressure contact. **Silver plated** current-carrying parts. Not flash plated but completely plated to reduce temperature rise.

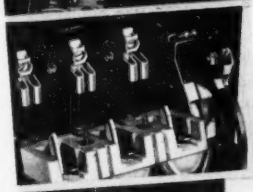
Positive Pressure Fuse Clips
reduce heating at fuse contacts 60% or more.



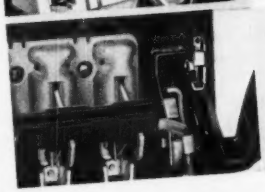
Padlock Attachment
locks switch "ON" or "OFF" with 1, 2, 3 or 4 padlocks of virtually any shape or size.



True Quick-Make, Quick-Break
Mechanism design makes it impossible to retard or to "tease" the operation.



Dead Front
construction. All exposed parts are dead when switch is in "OFF" position. **Hinged Arc Barrier** makes it easy to reach line terminals.



Full Cover Interlock
Switch cover can be opened or closed by authorized personnel without removing parts or interrupting service.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

NEW EQUIPMENT

Strain Gage

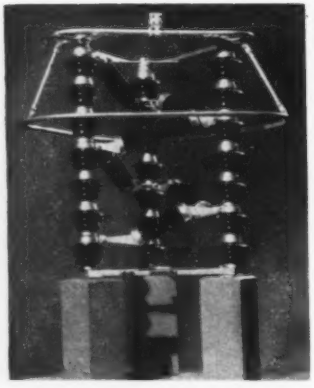
Electronic crane scales activated by SR-4 bonded resistance wire strain gages are being used to weigh massive parts and equipment for GE's Transformer and Allied Product Dept.

Resistance wire strain gage load cells of 300,000 capacity are permanently installed in each of two crane hooks. Weight is read directly from a portable weight indicator.

Changing resistance of SR-4 gages when subjected to strain transmitted by column activate scale.

Chief use of the crane weighing system is to determine the weights of transformers for shipping and engineering data.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa.



Self-Supporting Arrester

Designed to eliminate the expense of supporting structure and bracing insulators, this new low height station type self-supporting high voltage arrester utilizes a spiral stair-case pattern. Ratings from 195 through 242 kv are available.

A complete single-pole arrester consists of a series of type SV arrester units mounted spirally between supporting columns of standard apparatus insulators—considerably reducing arrester height.

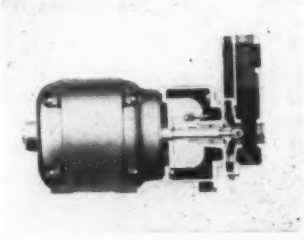
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Self-Priming Motorpump

Intended for pumping applications under suction lift in the presence of air or vapor this new line of pumps eliminates appreciable volumes of air, and thereby reestablishing prime, by recirculating liquid trapped in the casing.

Capacities up to 800 gpm and heads up to 180 ft in motor sizes ranging from ¼ to 25 hp are available.

Standard models have cast iron casings with bronze impeller.



Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.

Alternating Current Recorder

A new, trouble-shooting combination, the TAG Recording Ammeter used portably with a Weston Clamp-Ammeter Model 633 is now available for measuring and recording alternating current without breaking the circuit.

Designed to check on and make a permanent record of the use of alternating current and circuit reactions, the combination can be employed to cover all operations within a power, manufacturing, or processing plant in preventing wasted power, time, labor and money.

Records obtained can reveal proper or improper handling of plant equipment, and detect unwarranted use of power.

Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark, N. J.

•

Mercury Lamp Transformers

A revised line of transformers for indoor and outdoor operation of mercury (H-1) lamps has been designed to meet the specifications of leading mercury lamp manufacturers.

Single and two lamp units—normal and high power factor are available for 115 and 230 volt circuits.

Aerial, pole top, pole base and vault types are listed.

Jefferson Electric Co, Bellwood, Ill.

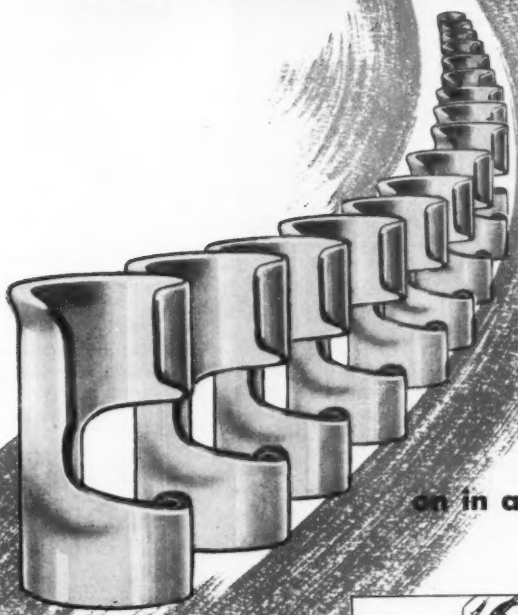
•

Metallizing Guns

Two new metallizing guns, the Type 4E for machine element work, and the Type 5E for corrosion protection coatings are reported capable of developing the highest spraying speeds yet available in guns designed for hand-held operation.

The 4E is designed to spray all wires from 20 gauge to ⅛ in. in any metal. The 5E is designed for spraying the softer metals, such as zinc and aluminum, for protection of equipment and structures against corrosion. This gun sprays ⅛-in. wire and will

HUBBARD SERVISLEEVS



on in a second . . .

protect for life

Place slot of ServiSleev over strand, turning bell mouth toward clamp.

Tap lightly with pliers — ServiSleev fits snugly over free strand end.

The complete installation, strong, neat, and safe, is made in a few seconds.

Stock No.	Dimensions—Inches		Approx. Shipping Wt. Lbs., 100 Pcs.
	Strand Size	Overall Length	
7451	3/16	1 1/4	2.2
7452	1/4	1 3/8	3.4
7453	5/16	1 1/2	5.5
7454	3/8	1 3/4	7.8
7455	7/16	2	11.0
7456	1/2	2 1/4	14.3

The ServiSleev is quickly slipped over the guy wire and the belled end turned toward the clamp. A few light taps with pliers or wrench drive it over the loose end of the strand.

The heavy galvanized steel retains its original shape and maintains a rigid grip on the guy strand. Design is such that the ServiSleev "rides" easily over the loose end of the strand. Hubbard ServiSleevs are easily installed, uniformly neat, and provide permanent protection.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

THE MARK OF MARCUS MTC QUALITY

nothing succeeds like success—and the formula for the latter remains unchanged. The combination of a good product with genuine interest in the customers' side of the transaction has necessitated the completion of our third and largest expansion move within the past 5 years. What better recognition of the *"Mark of Quality"!*

•

Representatives in Principal Cities

General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase.

450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø—120/208Y, 4 wire.

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

MARCUS DRY TYPE Transformers

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS *EXCLUSIVELY*.

1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

• DISTRIBUTION • GENERAL PURPOSE • UNIT SUBSTATION • PHASE CHANGING • ELECTRIC FURNACE • RECTIFIER • WELDING • MOTOR STARTING • SPECIAL

NEMA

MARCUS TRANSFORMER CO., Inc.

[illegible] 5, NEW JERSEY

deposit as much as 55 lbs of zinc or 15 lbs of aluminum per hour.

The guns may be mounted for use on a lathe or other machine or may be used in hand-held operation.

Metallizing Engineering Co, 38-14 30 St, Long Island City, N. Y.

•

Sound System Units

Basic elements for custom PA systems permit engineers to assemble equipment for varied applications in industry.

Standard amplifiers, record changer, radio, intercom amplifier, and other special equipment are available.

Newcomb Audio Products Co, 6824 Lexington Ave, Hollywood 38, Calif.

•

Emergency Lighting Unit

Insurance against light failures in the event of a power failure is provided by the Lightguard.

One or two 25 watt sealed beam floodlights are supplied by a glass for storage battery. A magnetic switch automatically connects the floodlights to the battery when normal current is

WHY VICTOR PINTYPES KEEP DISTRIBUTION COSTS DOWN

V RUGGED, THICK CROSS SECTION gives maximum strength and resistance to impact.

V LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tieing easy and quick.

V SMOOTH CONTOUR *plus* smooth, hard glaze give unsurpassed self-cleaning characteristics—ideal for contaminated areas.

V MAXIMUM LEAKAGE DISTANCE conserves current, helps maintain rated voltage, and minimizes outages.

V EACH VICTOR LOW-VOLTAGE PINTYPE is individually inspected at every point of manufacture.

V HIGHEST QUALITY WET PROCESS PORCELAIN provides highest dielectric and physical strength.

VICTOR NO. 5 LOW-VOLTAGE PINTYPE. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

These are only a few of the reasons why VICTOR Low Voltage Pintype Insulators are famous for performance and economy. They last longer—give *extra* years of service—cut line maintenance costs to a minimum. Power men everywhere prefer VICTOR Pintypes!

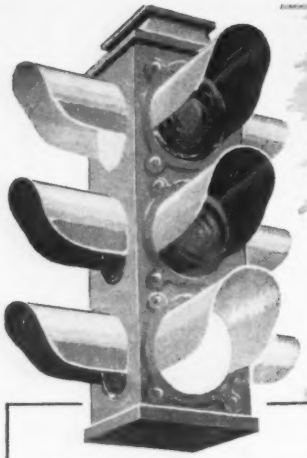
Do You Know that...

The first wet process porcelain insulators were produced at Victor in 1893. In fact, many of our skilled craftsmen have been making high quality porcelain insulators at Victor for over 40 years.

Specify

VICTOR PINTYPE INSULATORS

VICTOR INSULATORS, INC. VICTOR, N. Y.



DRAFT FANS

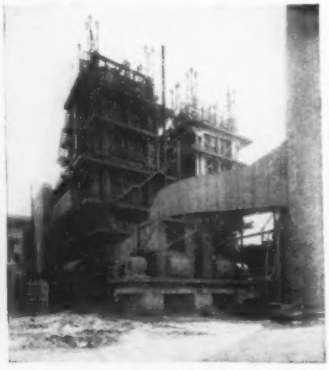
GO

on GREEN

GREEN FANS . . . Used by Many Leading Utilities

One significant fact about Green Fan Installations at the New Orleans Public Service Plant is that two different boiler manufacturers were involved . . . two different types of boilers but Green Draft Fans for all three boilers. Each boiler has two Green Induced Draft Fans and one Green Forced Draft Fan.

When a concern has specialized on an important piece of power plant equipment for many years, that firm is rightly called the "authority" on the subject. This is the position of Green Fuel Economizer Co. in the field of mechanical draft fans. The name Green is synonymous with Draft Fans highly acceptable to industry.



The Line of Green Induced and Forced Draft Fans includes many types in many sizes which are described in Bulletin No. 168. We shall be glad to discuss your fan requirements with your own engineers, with your consulting engineers and with the boiler manufacturer of your choice.

THE GREEN *Fuel Economizer* COMPANY INC.

BEACON 3, NEW YORK

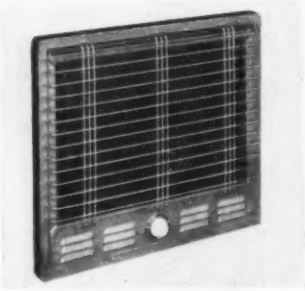
ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

interrupted. When not in use, the battery is kept fully charged.

Restoration of normal power automatically turns off floodlights and turns on charging unit.

Electric Storage Battery Co, Philadelphia, Pa.

•



Electric Heating Panel

Pyrex glass sheet backed by a solid conductive coating 16 millionths of an inch thick provides 1000 watts of radiant heat for home heating comfort.

Coating is permanently fired on to glass.

Berko Electric Manufacturing Corp, 179-05 Jamaica Ave, Jamaica 3, N. Y.

•

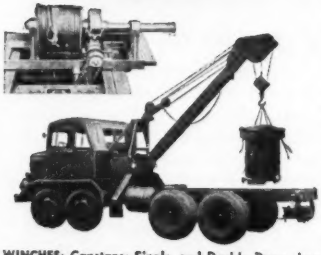
Pruning Saws

Outstanding characteristic of a new line of pruning saws is the spearpoint teeth made of Swedish charcoal steel.

The new line includes: No. 826, a general heavy duty 26 in. 6 point saw; No. 922 a narrow-bladed 22 in. 5½ point saw; No. 622, a curved pruner with 22 in. 5 point blade; No. 1030, a Bull Saw, with 30 in. 4½ point blade; No. 514 a narrow blade

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
½ TON TO 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
962 63rd ST., BROOKLYN 20, NEW YORK

● Junior is rushing things a bit— besides, this Koppers Pole will still be around when he reaches man's estate.

Koppers Poles are famous for the way they last; for the way they give decades of dependable service; for the way they make line operation easier and more economical.

Specify Koppers! You'll get strength-retaining poles that cut maintenance costs—that provide long periods of continuous service.

KOPPERS COMPANY, INC. **PITTSBURGH 19, PA.**

KOPPERS **PRESSURE-TREATED WOOD**

KPF **POLE TOP SWITCHES**

Simple design
means economical installation

Bore two holes in a single crossarm, tighten two bolts, attach the conductors, and the switch is installed! No separate dead-ends, no "extra" insulators required. Saves man hours, saves installation costs.

Simple design also means lower first cost, less maintenance. Insulator stacks are readily adjustable for line sag. Free-floating, self-aligning, silver-surfaced blades and jaws maintain proper contact under all conditions of sag adjustment. Switches can be used in vertical, horizontal or triangular mountings. The low-cost, trouble-free service rendered by KPF switches is attested by the many thousands in use throughout the world.

KPF **ELECTRIC COMPANY**
1624 E. Alpine Avenue, Stockton, Calif.

curved pruner with a 14 in. 8 point blade and long handle; No. 424, a bow saw with a replaceable 24 in. blade.
Seymor Smith & Son Inc, Oakville, Conn.

•

Moist Heat Pad

Moist heat reportedly produced by this pad is due to interior wiring which is made of specially processed aluminum surrounded by lead strips. Rapid cooling of the heated lead strips reportedly draws moisture from the atmosphere.

By alternately turning the switch on and off, the patient can regulate the amount of heat to suit his or her own comfort.
Ottawa Electric Appliances, Ottawa, Ill.

•

Dry Chemical Fire Extinguisher

Electrical arcs are reportedly quickly broken by the mechanical effect of the solid particles and resulting fires quickly extinguished by simultaneous chemical reaction of Fyr-Fyter dry chemical extinguisher.

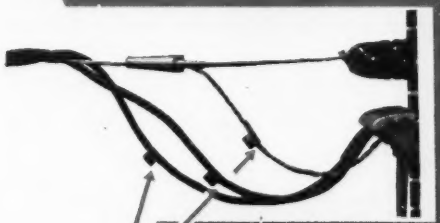
Finger-tip nozzle control provides

FARGO Service Cable Dead Ends for Aluminum, too!

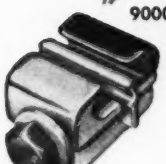
The Fargo
Aluminum One-Piece Jaw

The Fargo
HB-1 House Bracket

The Fargo
Flexible Bail Type
Service Cable Dead End



The Fargo
9000 AC Series Connector



Equipped with the Exclusive FARGO One-Piece Jaw That's Self-Aligned for Better Gripping

Like its famous predecessors, which were designed for copper or copper-Copperweld messengers—the new Fargo ADE Dead End is equipped with the exclusive Fargo one-piece jaw that's self-aligned for ease of installation and better gripping. This time, however, the jaw is made of aluminum alloy, rather than bronze, to meet requirements of aluminum installations.

It is housed in a casting made of Tenzaloy—an excellent, high strength, weather-resistant, age-hardening alloy.

The completed unit has a rated strength of 1100 lbs., which is controlled by the flexible bail wire. Thus, when used on all-aluminum messengers, it will develop the full strength of the conductor up to its 1100 lb. bail limit. And, when used on ACSR, it has a minimum strength of 65% of the ACSR rating up to 1100 lbs.

Bi-Metal Connectors, too

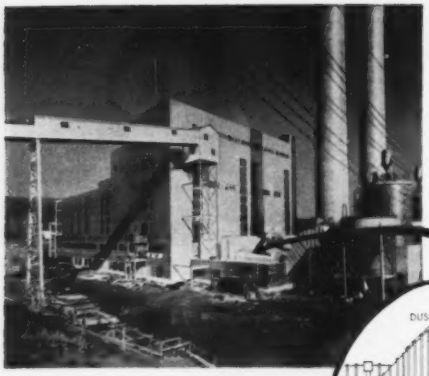
The new Fargo 9000 AC series bi-metal connectors are a "natural" for taking care of the transition from copper secondaries to aluminum service wires—and from aluminum service wire to copper house risers. The 9000 AC series has cast aluminum female and bronze male members, with a bi-metal spacer bar. Conductor contacts are of like metals for long service, free of galvanic corrosion. Connectors of all-cast aluminum are also available.

Ask your Line Material Field Engineer to give you complete details.

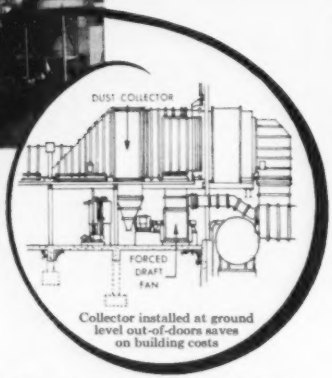
FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N.Y.

Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin



Titus Station
Metropolitan Edison Co.
Reading, Pa.



Collector installed at ground level out-of-doors saves on building costs

Answer *your* specific dust control problems with an

AEROTEC

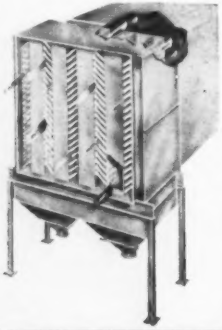
DUST COLLECTOR
exactly tailored to your needs

Here is one of the many instances in which the Aerotec Design 3 RAS Dust Collector proved its high efficiency so conclusively that Metropolitan Edison purchased a third unit. Gilbert Associates Inc., of Reading, Pa., were designers and constructors. Three bituminous coal-fired steam generators at this modern power plant, will be equipped with Aerotec Collectors. Layout and breeching are so designed that an Aerotec electrical secondary can be added at a future date without loss of the initial investment.

This mechanical collector, with its multiple, small-diameter tubes, offers you the advantages of high dust recovery in the ultra-fine ranges, even at partial load. The tubes are permanent mold aluminum castings of absolute uniformity. This construction provides the smooth inner wall necessary to ultra-fine dust collection. Tubes are assembled at the factory in lightweight "building block" sections. These assemblies permit flexible arrangement to suit your needs, with the economy of standard construction.

Let our engineers bring to your problems the benefits of their long experience in the field of flyash collection. No obligation.

Typical Inlet and Outlet Variations



Catalog 601 gives you complete details on standard and special Aerotec arrangements, plus other useful data on dust collection. Call or write for your copy today.

Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 28 Principal Cities)
Canadian Affiliates: T. C. CHOWN, LTD.
Montreal 25, Quebec — Toronto 3, Ontario

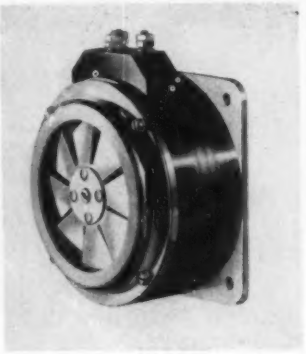
THE AEROTEC CORPORATION
GREENWICH, CONN.

controlled blasts of powder when needed and assures complete shut-off to conserve unused powder.

Pressure is provided by carbon dioxide pressure cartridges.

Fyr-Fyter Co, Dayton, Ohio

•



Synchronous Motor

Operating on the reluctance principle, this new synchronous motor has no brushes, slip rings, rotating coils or permanent magnet. It can be built to operate continuously at any voltage below 250 volts, either single or polyphase.

No starting equipment is required, the motor being able to start and pull into step at any frequency from 10 to 400 cycles.

Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.

•

Heavy-Duty Master Switch

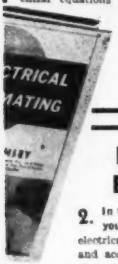
A redesigned master switch featuring a new cast-aluminum cover and up to five adjustable stops has been announced by GE.

Adjustable stops on the switch

ADVANCED ENGINEERING MATHEMATICS

Just Out

1. Provides a reference and guide on the branches of mathematics which the engineer must understand and use in his daily work. Covers ordinary differential equations, with particular emphasis on linear equations with constant coefficients; Fourier series; operational calculus; separable partial differential equations and associated boundary value problems; functions of a complex variable; vector analysis; and various numerical methods. A special chapter provides data and information on mechanical and electrical vibrations. **By C. R. Wylie, Chairman, Dept. of Math., Univ. of Utah. 640 pages, 105 illus., $7.50**



ELECTRICAL ESTIMATING

2. In this manual is all the information you need to estimate the cost of any electrical construction job . . . quickly and accurately. Covers everything from the selection and training of estimators, and the proper use of estimating tools . . . to the cost of preliminary estimates, and the preparation of final bid sheets. Contains scores of sample estimates of actual construction costs. **By R. Ashley, Research Eng'r. 307 pages, over 190 illus., $7.50**

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3. That transmission line fact you want is in this handy guide giving principles, data, methods and cautions on all aspects of the lineman's work. Describes all the materials of line construction: poles, conductors, hardware, tools, electrical apparatus, etc. Information on construction, testing and maintenance shows how to meet problems with right choice of materials and methods. **By E. Kurtz, U. of Iowa. 2nd Ed., 652 pages, 682 illus., $6.00**

AMERICAN ELECTRICIANS' HANDBOOK

4. Hundreds of detailed descriptions, rules, methods, pictures, and practical data to help you install, maintain, and operate electrical equipment. Packed with the right answers about practical electricity which every man engaged in electrical work needs constantly at hand. Completely revised to bring the book abreast of best accepted practices—and make it a practical reference on electrical fundamentals, materials, equipment, and their applications. **By Terrell Croft. Revised by Clifford Carr. Sixth Ed. 1733 pages, 1327 illus., 400 tables, $7.50**

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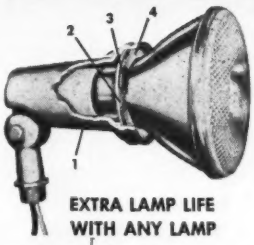
This offer applies to U. S. only

NEW STONCO NO. 56 "SUPER SPOT"

100,000 CANDLEPOWER FOR ONLY 300 WATTS



EXTRA LAMP LIFE WITH ANY LAMP

New Stonco "Cushion-Seal" provides maximum lamp cooling and almost double the life you normally expect from PAR-38 or R-40 reflector lamps outdoors. Write for full details and new catalog material.

The most powerful 300-watt sealed-beam spotlight ever made. Long range, high intensity, oval-shaped beam that can be rotated to exact fixed position desired. Heavy-duty cast aluminum for outdoor, weather-proof service, completely enclosed wiring, adjustable swivel; fully UL approved. Write for catalog and illuminating data on this and other Stonco units—all with ½" standard mounting accessories for complete interchangeability.

STONCO ELECTRIC PRODUCTS CO.

485 HENRY STREET • ELIZABETH 4, N. J.

3 VALUES!

★ One-Piece Construction
★ Wide Wire Range
★ Economically Priced

BLACKBURN *Hi-Strength* TERMINAL LUGS

Strongly constructed—all in one piece—yet small and compact to fit in small quarters. Ideal for indoor meter and switch connections, and other indoor uses. Only six sizes cover a range from No. 14 to 1,000,000 CM. Economically priced, too. Investigate this quality lug today.

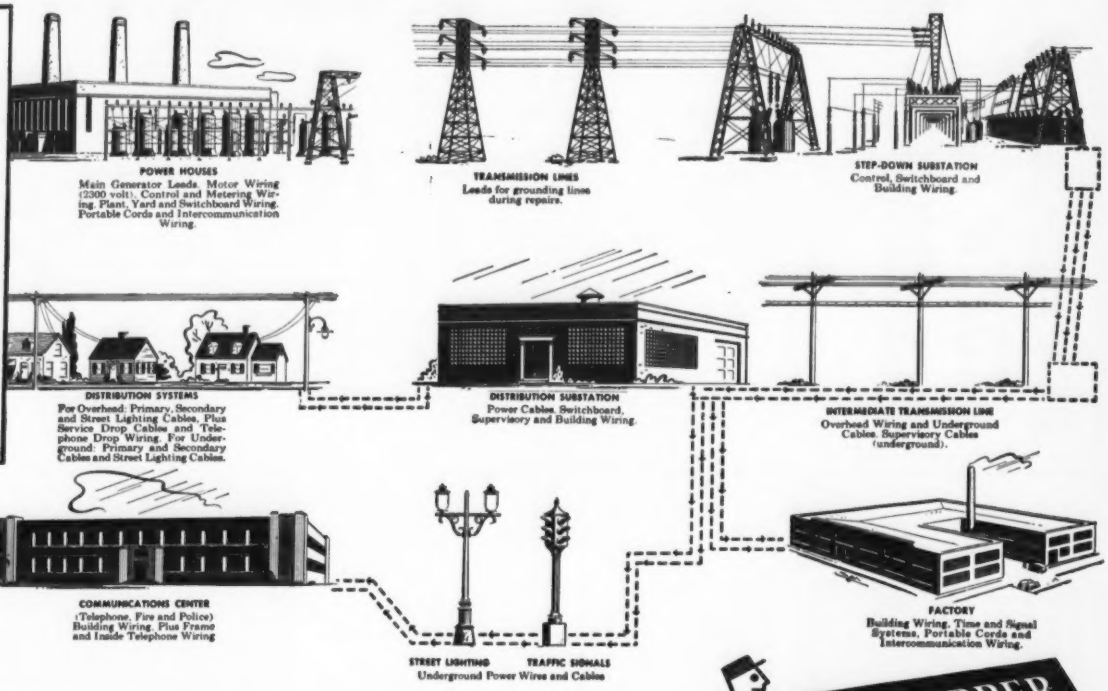
JASPER BLACKBURN CORP., 35 Madison St., St. Louis 6, Mo., CEntral 3007

You can solve any power puzzle

with U. S. Rubber Electrical Wires and Cables

For over 60 years United States Rubber Company has been manufacturing electrical wires and cables. Today, the range of these "U. S." products contains the answer to almost any wiring problem you may meet.

U. S. Rubber pioneered in developing Laytex® insulation made of 90% pure natural unmilled grainless rubber. From U. S. Royal Cables, Royal Master Portable Cords and Grizzly Underground Cables to Uskorona corona-resistant cable, the U. S. Rubber line includes utility wires and cables of every description, including cables fitted to IMSA specifications for traffic, fire and police needs.


POWER HOUSES
Main Generator Leads, Motor Wiring (2300 volt), Control and Metering Wiring, Plant, Yard and Switchboard Wiring, Portable Cords and Intercommunication Wiring.
TRANSMISSION LINES
Leads for grounding lines during repairs.
STEP-DOWN SUBSTATION
Control, Switchboard and Building Wiring.
DISTRIBUTION SYSTEMS
For Overhead: Primary, Secondary and Street Lighting Cables, Plus Service Drop Cables and Telephone Drop Wiring. For Underground: Primary and Secondary Cables and Street Lighting Cables.
DISTRIBUTION SUBSTATION
Power Cables, Switchboard, Supervisory and Building Wiring.
INTERMEDIATE TRANSMISSION LINE
Overhead Wiring and Underground Cables, Supervisory Cables (underground).
FIRE ALARM SYSTEMS
POLICE CALL SYSTEMS
Underground Communication Wires and Cables
COMMUNICATIONS CENTER
(Telephone, Fire and Police) Building Wiring, Plus Frame and Inside Telephone Wiring
STREET LIGHTING
TRAFFIC SIGNALS
Underground Power Wires and Cables
FACTORY
Building Wiring, Time and Signal Systems, Portable Cords and Intercommunication Wiring.

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.

U.S.RUBBER
SERVING THROUGH SCIENCE

provide for any combination of from one to five points of movement of the operating handle in either clockwise or counterclockwise direction.

The new switch is fully interchangeable in size and mounting with former GE types, and all wearing parts, such as contacts, cams, etc., are the same, simplifying parts replacement.

General Electric Co, Schenectady

•

Radiation Probe

A lightweight radiation probe, for detecting and measuring alpha, beta, gamma, and neutron radiations, has been announced by GE.

The probe is designed for use in hospitals and industrial laboratories where work with radioactive materials may contaminate clothing and equipment.

General Electric Co, Schenectady

Atomic Explosion Detector

"Radiation Lampshades" designed to quickly and accurately determine the position of an atomic explosion are being incorporated into the Schenectady, N. Y. area civil defense "grid monitor system."

During atomic attack intense heat radiation would scorch the inside painted surface. Position of heat shadows formed by upper edge and a pointed brass rod projecting upwards inside the device would furnish direction and height of bomb burst.

The lampshade was developed by the Mohawk Association of Scientists and Engineers, a Schenectady civic group.

•

Temperature Monitor

A new electronic scanning system designed to automatically and continuously monitor up to 270 separate temperature points records only those temperatures which deviate beyond a pre-set limit.

An audible alarm permits immediate correction of excess temperatures.

In operation, when a temperature exceeds the setpoint, the off-limit point prints on the chart indicating temperature. As alarm circuits are energized, printing timer is started.

Minneapolis-Honeywell Regulator Co, Minneapolis, Minn.

Clean Penta protection keeps poles healthy!

Penta is certain . . . always the same!

You can absolutely depend on Chapman Penta for clean, certain protection from ground line decay, shell rot, top rot and insect damage. This modern wood preservative contains Pentachlorophenol, famous for its effectiveness, stability and uniformity. Penetrates deeply into the wood and will not leach out or evaporate. Doesn't affect conductivity or cause corrosion . . . creates no special problems. It's cleanliness makes it the favorite with men who climb the poles.

Specify PENTA treatment for safeguarding your poles, cross arms and other wood construction. With all its advantages, it costs no more than other types of preservation. Write for complete facts and names of companies supplying Penta-treated forest products.

CHAPMAN CHEMICAL COMPANY

333 N. Michigan Ave., Chicago 1, Ill.

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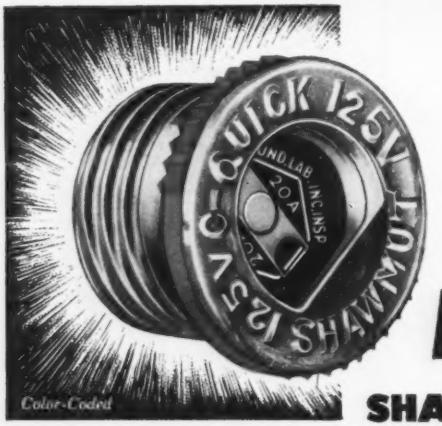
CHAPMAN™

Penta Preservative

It's Clean! It's Certain!

Conforming to A.W.P.A. Specifications P8-49 and P9-49.

the fuse with Nine lives



NEW SHAWMUT C-Q-T*

CONSERVES ITS LIFE— BLOWS ONLY WHEN NECESSARY

MADE TO MEET THE NEED

Dishwashers, Heaters, Washing Machines, Refrigerators, Deep Freezers, Irons and countless other modern household appliances all put heavy starting loads on branch circuits. As a result, most ordinary fuses *blow unnecessarily*. This means great inconvenience for the householder and many needless and unprofitable service calls. Chase-Shawmut's new **C.Q.T.** is a fuse that gives *longer safe time-delay on overload and consequently blows only when necessary*. It is *faster* protection on short circuit, too. Made especially to meet modern needs, as determined by the largest utility companies in the United States, **C.Q.T.** is the greatest advance in household fuses since 1900.

APPROVED BY UNDERWRITERS LABORATORIES

C.Q.T. is made in standard plug-type form to fit all standard fuse sockets. It is available in standard 15- 20- 25- and 30-Amp sizes. *Color-Coded for Convenience* (at slight extra cost), C.Q.T. can be ordered by color. Blue = 15 Amp; Orange = 20 Amp; Red = 25 Amp; and Green = 30 Amp.

SERVE CUSTOMERS BETTER—STOCK C.Q.T. NOW

Power Companies, Wholesalers, Contractors, Direct Buyers — Investigate these amazing new fuses at once. Write for free bulletin. Ask for prices. Samples on request.

*T. M. Registered

C-Q-T – "Awake At The Switch"

THE **CHASE-SHAWMUT CO.**

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

MORE NEW PRODUCTS about which you should know

Micro Switch, Freeport, Illinois, offers rigid lever actuated **High capacity Type A basic switches** in new line of "V" series. Switches offer lower operating force than on flexible leaf actuated switches. Switches are listed for ¾ hp, 115-v ac; 1½ hp, 230-v ac; 20 a for 125, 250 or 460-v ac; and 10 a 125-v ac . . .Westinghouse Electric Corp, Pittsburgh 30, Pa., announces new **20-kw and 5-kw RF generators** for dielectric heating applications. Push-button control, stepless adjustment of output power and a complete complement of protective devices put equipment on a semi-skilled basis. RF radiation is minimized and generators comply with FCC regulations.

Mastercraft Products, 95-01 150th St, Jamaica 4, N. Y., has developed a Scru-Tite **screw anchor** made of tough Tenite. Light weight, corrosion proof, non-magnetic, these screw anchors find application wherever screws, bolts, or nails are used in fastening all types of solids, as brick, wood, concrete, glass, metal, and bakelite. . . . Russell and Stoll Co, 125 Barclay St, New York 7, N. Y., offers a new line of Type DL **dust-tight lighting fixtures** for use in Class II, Groups E, F, G, and Class III locations. Stated to be simpler in design and remarkably cool in operation. Made of cast aluminum alloy, lamps are available in pendant or junction box types, with or without reflectors.

Thomson Industries, Inc, Manhasset, Long Island, has developed the Nylined **bearing.** Bearing consists of outer sleeve of inexpensive metal with thin lining of nylon bearing material. Company states Nylined bearings afford closer fits, present no cold flow or creep problem and eliminate need for wide clearances. . . . Smith Control & Instrument Corp announces new SCAICO **expanding tube thermostat** with trouble free operation. Quick and easy setting of control point up to 600 F is provided. Silver contacts provide two breaks in series for longer operating life. Available in conduction, convection, or immersion types for 600-w load at 110/230-v ac or dc.

now, unitype—

a metal enclosed cubicle type

AIR BLAST BREAKER

by BROWN BOVERI

WITH *ALL* THE ADVANTAGES OF *ALL* BROWN BOVERI AIR BLAST BREAKERS

PLUS--

1- READY FOR INSTALLATION

These factory tested and assembled units are ready for setting on foundation and connection.

PLUS--

2- MAXIMUM CONVENIENCE IN MAINTENANCE

All working parts are easily accessible for convenient parts replacement.

PLUS--

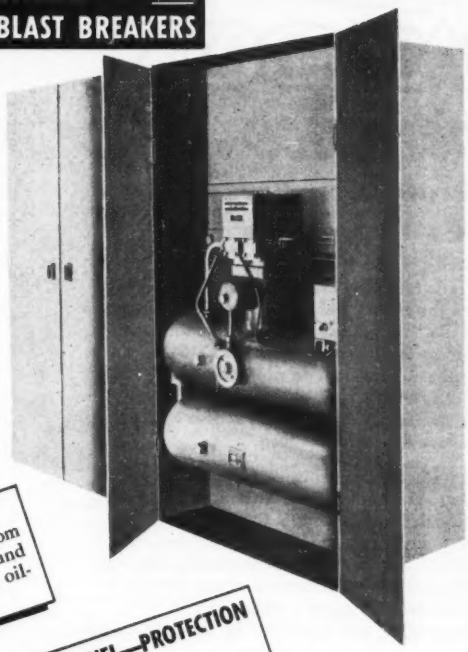
3- NO FIRE HAZARD

Absolute freedom from danger of fire and all hazards and inconvenience associated with oil-type switchgear.

PLUS--

4- NEW PERSONNEL—PROTECTION SAFETY FEATURES

The advanced, well-balanced design incorporates new safety features which protect maintenance and inspection personnel.



STANDARD RATINGS

INDUSTRIAL TYPES
(Isolated phases)

ASA Line	BB Type	kV	Amps	mVA Interrupting
—	300 i	7.2	1000	250
8	301 i	7.2	1500	250
9	302 i	7.2	2500	250
—	302ai	7.2	1000	500
10	303 i	7.2	1500	500
11	304 i	7.2	2500	500
12	305 i	13.8	1000	250
16	306 i	13.8	1500	500
17	307 i	13.8	2500	500
18	308 i	14.4	1500	1000
—	308ai	—	—	—
19	309	—	—	—
20	310	—	—	—
21	311	—	—	—
23	312	—	—	—

STATION TYPES
(Segregated phases)

ASA Line	BB Type	kV	Amps	mVA Interrupting
—	—	—	—	—
8	—	—	—	—
9	—	—	—	—
—	302as	7.2	1000	500
10	303 s	7.2	1500	500
11	304 s	7.2	2500	500
12	305 s	13.8	1000	250
16	306 s	13.8	1500	500
17	307 s	13.8	2500	500
18	308 s	14.4	1500	1000
—	308as	14.4	2500	1000
19	309 s	14.4	4000	1000
20	310 s	14.4	2500	1500
21	311 s	14.4	4000	1500
23	312 s	23	2500	1500

Mail Coupon Today!

Brown Boveri Corp., 19 Rector St., N. Y. 6

Please send literature about your Unitype Air Blast Breaker.

Name..... Title.....

Company .....

Address .....

WRITE FOR DATA

BROWN BOVERI

BROWN BOVERI CORPORATION

19 Rector St., New York 6, N. Y.

when the
FIRE WHISTLE
BLOWS
It's Too Late!

Let CARDOX *Experience* Plan Your Fire Protection Before Fire Wrecks Your Plans

In hundreds of plants the fire whistle may *never* blow! These are the plants where CARDOX Low Pressure Systems guard the "hot spots." So overwhelming and positive is the mass application of CARDOX CO_2 that fire seldom has a chance. The protection list includes practically every kind of flammable liquid or electrical hazard on the books—and scores of interesting Class A hazards as well.

CARDOX engineers *originated* low pressure carbon dioxide systems to stop fire cold at a time when existing protection just wasn't good enough. CARDOX research—millions of dollars and many thousands of days—advanced CARDOX Systems to their present perfection. From CARDOX experience with some of the world's toughest fire hazards have come a know-how in low pressure carbon dioxide, and a fire record, unapproachable.

The know-how and experience of CARDOX fire authorities can be of incalculable value in your protection planning. A CARDOX survey puts it at your disposal—costs you nothing. Write for a CARDOX survey today—now.

CARDOX
ORIGINATORS OF
LOW PRESSURE CO_2
Fire Extinguishing SYSTEMS*
First installation 1939, thousands since

*Cardox Systems and Equipment are covered by U.S. and Foreign patents, issued and pending.

CARDOX CORPORATION
BELL BUILDING
CHICAGO 1, ILLINOIS
Offices in Principal Cities

WHAT THEY'RE SAYING
at industry meetings

Federal Construction Projects

William Voigt, Jr, *executive director, Izaak Walton League of America.*

Our organization sees the following undesirable results in what certain federal agencies are doing:

1. Flood control that doesn't control floods.

2. Useless inundation of land that can't be spared from the production of food and fibrous plants.

3. Waste of tax dollars on hydraulic structures that siltation will destroy during the lifetimes of men sitting before me.

An excellent example of federal planning is the Shadehill reservoir in northwestern South Dakota. Built by Reclamation at an estimated cost in 1949 of $11 million, it was primarily designed for irrigation. Two weeks ago, after the dam was already completed, tests of the water in the reservoir showed such great deposits of selenium and other salts and alkalis as to render the water unfit for irrigation. This is how federal planning was to "make the desert bloom."

Power Economy In New England

Howard J. Caldwell, *chairman, Power Committee, New England Council and president, Western Massachusetts Electric Co before a quarterly meeting of the New England Council*

1. President Truman's Economic Advisers' "Report on New England Economy" gratifyingly recommends that privately-owned utilities participate in financing and operation of the power component of multi-purpose power projects.

2. This solution emphasizes the committee's desire to minimize federal government participation in these projects.

3. Power phase of multi-purpose projects which might be developed, whether publicly or privately financed, are not of sufficient aggregate size to influence power cost.

4. Private enterprise and government partnership in resource development is to be desired, with New Englanders occupying a dominant role in the planning.

5. The kind of industry New Eng-

land has and wants is not strongly affected by power cost differentials between NE and US figures. The differential is not great and is narrowing. Increased utilization of electricity by our manufacturers is unrestrained by power cost differentials. In fact, a rise in kw per worker is being experienced.

6. Although the report says a possible explanation of high energy costs lies in the failure of effective pooling of resources in this area, power pooling is a changing art. It was pioneered in New England. The New England set up will be improved even though I have no doubts our present power pooling techniques are unexcelled.

The report, though somewhat generalized, is constructive, and a refreshing change from past efforts to include political objectives in a "help New England" package.

Higher Transmission Voltages

P. L. Bellaschi, *Consulting Engineer, before the AIEE Pacific General Meeting.*

Future development of transmission in the United States seemingly favors transmission voltages higher than 230 kv in order to meet increased transmission power capability. The use of higher voltages is desirable in order to obtain more economical transmission of large blocks of power.

However, rapid technological advances and developments on 230-kv transmission now make possible higher power capabilities and the greater economies required without recourse to higher voltages. Some contributing factors have been: Series compensation, improved terminal equipment, better control and communications along with improved breaker design, use of bundle conductors, etc.

Even though world wide consideration is being given to extra-high voltages, the role of 230 kv in future power development in this country is apparent from the anticipated transmission system growth. The 9,000 or 10,000 circuit miles of 230 kv presently installed are expected to double within the decade. Much of this will be the result of superimposing 230 kv on existing 138-kv and 115-kv systems to provide increased capability. With this increased usage of 230-kv equipment, still more technological advances are expected which will show further the importance of 230 kv as an economical power transmission voltage.

Line foreman has trouble, calls for materials fast.

"RCA 2-WAY RADIO cuts our outage time 90%"

says Mr. Milton Sturdivant, Superintendent of Construction and Maintenance, Brazos River Transmission Electric Co-operative, Texas

"WITH RADIO, our crew is on the job as fast as it formerly took us to reach a phone. *Radio is indispensable* . . . we just couldn't function without it."

RCA Radio covers big Texas utility

The Brazos River System stretches out over 100,000 square miles of Texas . . . includes steam plants, hydro plants, and 1000 miles of 69 KV lines. RCA 2-way radio operates from seven base stations in power plants, linemen's homes, and 28 mobile stations in cars, pick-ups, and trucks. Maintains instant voice contact between supervisors, foremen, load dispatchers, line crews, line patrolmen. Three years on the job, 2-way radio is giving the vital communications that keeps the system running smoothly.

Could your operation use radio?

Everywhere it's applied, *RCA 2-way radio works wonders.* Saves time, manpower, money. Ends aimless driving. Saves wear and tear. Speeds repairs in emergencies. Pays for itself many times over through better, more efficient operation.

Radio easy to install—operate—maintain

Mobile units are compact, rugged . . . can be installed in truck or car quickly and efficiently. Easily maintained, use standard tubes. Central transmitter serves any number of mobile units. Designed and backed by RCA . . . world leader in radio.

Get full story on RCA 2-way radio now. See how it can help out on your operation. Mail coupon . . . TODAY.

Headquarters relays call. Also notifies field superintendent.

Near-by line truck is ordered to rush materials to trouble spot.

Meanwhile field superintendent also drives to trouble spot.

Dept. 45W, RCA Engineering Products Department, Camden, N. J.

Please send my FREE copy of illustrated booklet on how RCA 2-way radio can save time, manpower, and money for me.

Name_____

Title_____

Company_____

Address_____ City_____ State_____

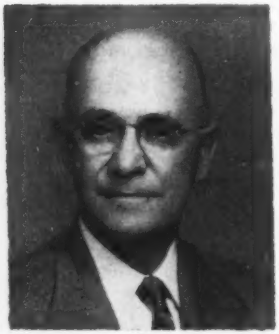
RCA RADIO CORPORATION of AMERICA

NEWS ABOUT PEOPLE

Dougherty Chief Engineer of Jersey Central P&L

Charles A. Dougherty, former division engineer for Pennsylvania Electric Co at Altoona, Pa., has joined Jersey Central Power & Light Co as chief engineer.

Dougherty started in the utility field



C. A. DOUGHERTY

with Detroit Edison Co in 1921 as distribution engineer. Five years later he went to Pennsylvania Edison Co, serving until 1930 as an electrical engineer and as consulting engineer of the Municipal Service Management Co, an affiliate. From 1932 to 1946 Dougherty was engineer of transmission and distribution for Penn Edison and then became division engineer of Penelec when Penn Edison was reorganized.

Active in the affairs of Pennsylvania Electric Association, Dougherty is past chairman of the transmission and distribution committee and the engineering section.

•

W. L. Teach has been appointed general superintendent of Central Illinois Light Co's electric department at Springfield. He joined the company in 1926 as a clerk in the DeKalb office. Five years later Teach transferred to the Springfield division as combustion engineer at the Capitol Avenue station. He later served as boiler room foreman and in 1943 was promoted to assistant superintendent of the station. In 1945 Teach was named superintendent of electric production, substations, and underground distribution.

L. R. Ludwig, assistant to the vice president in charge of industrial products for Westinghouse Electric Corp, has been appointed director of engineering and research for the Atomic Power Division. He has been with the company since 1925 and served as manager of the Buffalo Motor and Control Division before he was made assistant to the vice president last year.

Virgil H. Lammers, associate engineer at Cincinnati Gas & Electric Co's West End Station, has been named operating engineer of the utility's Walter C. Beckjord Plant now under construction. In other appointments at the plant **William V. Van Gilse** was made plant engineer and **Andrew F. Schafer, Jr,** maintenance supervisor. Lammers started with the company in 1940 and in his new position will be responsible for station operation at the new plant. Van Gilse, former junior engineer at the West End Station, will be responsible for results, testing, instrumentation, and control. Schafer has been maintenance foreman at West End and will have charge of general maintenance at Beckjord Plant.

Frederick J. Robinson, Latin American sales manager for Sylvania Electric Products, Inc, since 1943, has been appointed director of the company's International Sales Division. He joined Sylvania's industrial relations department in 1942 and shortly afterwards became assistant to the director of the International Sales Division.

James C. P. Long has joined the Washington, D. C., engineering staff of Sprague Electric Co, North Adams, Mass. He had been head of the Material Coordination Section of the Bureau of Aeronautics, U. S. Navy Department.

GE Names Fisher, Reid, and Nutter to New Posts

Clayton P. Fisher, Jr, has been appointed manager of materials and purchasing for General Electric Co's Major Appliance Division. He succeeds Lee D. Nutter who has been transferred to New York as manager of major appliance sales in the New York district.

GE has also announced the appointment of Ralston B. Reid as assistant manager of the advertising and sales promotion department of the Apparatus Marketing Division.

Fisher has been serving with the apparatus advertising and sales promotion department in Schenectady as manager of the apparatus exhibit train division and in that capacity was responsible for the "More Power to America Special." He joined GE at Schenectady in 1938 as a member of the publicity section and was appointed manager of the Apparatus News Bureau in 1944.

Nutter started with the company in 1937. In 1948 he was named assistant manager of purchasing for the former appliance and merchandise department and was made manager a year later.

In his new position Reid will coordinate activities of the advertising and promotion department's five advertising sections, visual education section, and the company news bureau at Schenectady. Manager of industrial advertising for the department since 1943, Reid has served GE in news, editorial, and advertising capacities for the past 21 years.

•

George P. Passmore has been appointed assistant to the vice president in charge of manufacturing at Harrison, N. J., by Worthington Pump & Machinery Corp. Manager of the company's Wellsville, N. Y., plant since 1941, he will be replaced there by **A. M. Tullo.** Tullo has been assistant works manager at the Harrison plant since 1945. In other appointments the company named **John**

THIS IS AN ANTENNA MAST

It serves as an insulating bushing and a standoff insulator to carry a radio antenna out through the wall of the pressurized cabin of a bomber. It is an airfoil in section, thin-walled, with a hole for the conductor going "around the corner," the hole and the whole straight and true.

As originally designed, it was a part to be machined from an organic insulating material. The problem of carbonizing and tracking of the surface of such material, which made it unsuitable, is readily overcome in porcelain, *if* the part can be made.

Lapp made this part, just as it has made hundreds of other unusual and tricky shapes, to solve unusual or tricky electrical or mechanical requirements.

In the successful production of a large volume of "special porcelain" business, Lapp has learned much of the nature of electrical porcelain, of ways in which its strengths can be utilized to accomplish specific objectives. Much, too, of the production skills, techniques and controls which assure continuing and steady volume production to specification.

And no skill, technique or control which applies has been overlooked in the establishment of production methods for routine parts.

On high-voltage insulators, and on porcelain parts of equipment used on your system, look for the name LAPP. It's your guarantee of sound mechanical and electrical performance . . . of extra operating security . . . of long life . . . of low upkeep.

Lapp Insulator Co., Le Roy, N. Y.

Lapp

CEDAR
POLES
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FIR
CROSS ARMS
•
Latest and most modern facilities for PENTA CHLOROPHENOL TREATING
•
LONG LIFE
CLEANLINESS
LIGHT WEIGHT
•
TWO Strategically Located Yards:
Minneapolis, Minn.
Findlay, Ohio

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

Burlick assistant to the works manager at the Harrison plant in charge of industrial engineering activities; **Max A. Heyman,** assistant to the works manager at Harrison in charge of production control activities; **W. D. Sizer,** manager of regional engineering and service department; **George F. Habach,** executive engineer at the Harrison plant; and **Everett Schmachtenberg,** chief engineer of the centrifugal engineering division at Harrison.

G. Ross Henninger has been appointed assistant director of the Engineering Extension Service at Iowa State College. He has been on the service staff since 1950. Henninger formerly was director of publications for the Illuminating Engineering Society and has also worked for American Institute of Electrical Engineers. Serving as associate editor of AIEE's "Electrical Engineering," for three years, he became editor in 1933. Previously Henninger served as engineering editor of the "Journal of Electricity," which subsequently became "Electrical West," a McGraw-Hill publication.

James F. Kelly, electrical plant engineer, has retired after serving 48 years with the Public Service Electric & Gas Co., Newark, N. J. Joining the utility in 1903, he served as switchboard operator, substation operator, load dispatcher, and chief electrician at the Marion Station before becoming electrical plant engineer in 1919.

Tom E. Hughes has been named assistant general manager and **Roger D. Williams** general sales manager of the Cleveland Diesel Engine Division of General Motors Corp. Hughes formerly was general sales manager, and Williams has been in charge of industrial sales.

Frederick D. Hoitt has been made chief engineer at the Haverhill Plant of the Haverhill (Mass.) Electric Co, a subsidiary of New England Electric System. He formerly was chief engineer of the American Thread Co, Fall River.

Roy A. Burch has been promoted by Carolina Power & Light Co to manager of the utility's Spruce Pine, N. C., office. He succeeds **W. B. Humphrey,** Spruce Pine manager since 1944, who has been named assistant to the district manager at Hartsville, S. C. In another change **William S. Holcombe** was promoted from local representative at Black Mountain, N. C., to local manager there.

R. L. Biesele, Jr, chairman of the Department of Electrical Engineering at Southern Methodist University, has been named research professor of engineering. He will devote his full time to studies in the field of daylight and illumination. Succeeding him as chairman of the department is **F. W. Tatum.**

Bert L. Pearce has been appointed chief engineer of Link-Belt Co's Ewart plant in Indianapolis. The company also named **Russell T. Sweeney** assistant chief engineer at the plant. Pearce succeeds **Charles R. Weiss,** who has retired after 42 years of service at the company's Philadelphia and Indianapolis plants. For the last ten months Pearce has been assistant chief engineer for product design. He started with the company in 1936 and has held various positions in engineering and sales at the Dodge plant, also in Indianapolis, and Ewart plant. Sweeney joined the company in 1918 at the Dodge plant as a tool designer and later became chief draftsman. He transferred to Ewart in 1940 as assistant to the chief engineer and last January was appointed assistant chief engineer for application engineering.

Carl Lenz, manufacturing engineer for the Locke Department of General Electric Co since January, has been appointed manager of manufacturing of the department. With GE since 1924, Lenz had been manager of the Mattoon, Ill., plant of GE for four and one-half years before coming to Locke.

R. E. Howard has been named comptroller and assistant treasurer by Davey Compressor Co, Kent, Ohio. For the past six years he has been manager of the internal orders and invoicing departments of the company.

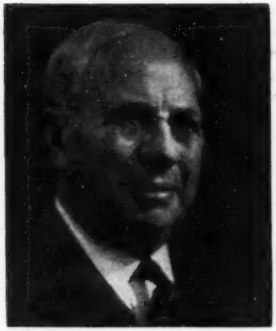
William E. Mitchell, former president of Georgia Power Co, has been named chairman of the Armed Forces Reginal Council for several southeastern states. From his Atlanta headquarters, Mitchell will help coordinate military production, buying, and construction.

OBITUARY

Albert I. Appleton

Albert Ivar Appleton, 79, founder of Appleton Electric Co, Chicago, died Oct. 18 at Chicago.

Appleton formed his own company



A. I. APPLETON

in 1903 and started to manufacture electrical conduit fittings and specialties. Under his guidance the company grew to one of the largest in the field. Appleton retired from active management of the business in 1946.

•

Donald E. Wageck, 48, assistant sales manager for Public Service Co of Northern Illinois, died Oct. 14 at Corpus Christi, Tex.

C. Blake Brewer, statistician engineer for Pennsylvania Power & Light Co for 20 years, died Oct. 23 at Allentown, Pa.

John J. Ross, electrical engineer with Rockland Light & Power Co since 1932, died Oct. 23 at Grand View, N. Y.

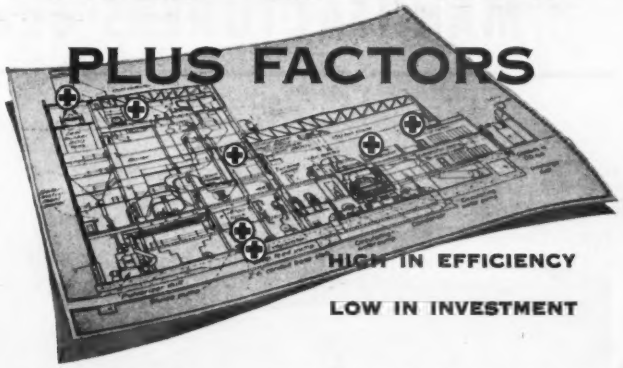
Bernard A. Gallagher, district manager of Electric Service Manufacturing Co's Pittsburgh office, died Oct. 8.

John R. Walsh, 31, sales engineer for Kerite Co, New York, was killed recently in an automobile crash.

John C. Coney, 83, member of the South Carolina Public Service Commission since 1922, died Oct. 21.

Homer C. Paiste, 64, superintendent of substations for the Akron division of Ohio Edison Co, died Oct. 26.

COMMONWEALTH'S SERVICES INCLUDE THOSE



A recent independent survey of Steam-Electric Construction Cost and Annual Production Expenses of 200 plants shows that those designed by Commonwealth Associates, engineering subsidiary of Commonwealth Services, held a very favorable position for efficiency and economy.

Among those selected as representing the "highest in efficiency of operation" while at the same time being in the group representing "lowest plant investment," eight among the leaders were of Commonwealth design.

In an over-all comparison, Commonwealth engineered plants were 10% lower than average in investment and 23% lower in production expenses.

Let us show you how Commonwealth design may increase your plant efficiency while holding investment to a minimum. Write for our booklet describing the services of Commonwealth Associates. Address: Commonwealth Services Inc., Department A6, 20 Pine Street, New York 5, N.Y.

- **Financial** *(including Registration and Prospectus details)*
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- **Stock Transfer and Proxy Solicitation**
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- **Public and Stockholder Relations**
- **Industrial Relations**
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- **Engineering . . . Design and Consulting** *(Electrical, Civil, Mechanical, Architectural, Chemical, Gas)*
- **Electric and Gas System Planning, Industrial Planning, Investigations, Analyses and Reports**
- **Rate Research and Design, Audits and Rate Cases**
- **Representation Before Regulatory and Other Agencies**

COMMONWEALTH SERVICES · INC. AND COMMONWEALTH ASSOCIATES · INC. ENGINEERING SUBSIDIARY

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7 HAYES STREET JACKSON, MICH. DIAL 8121

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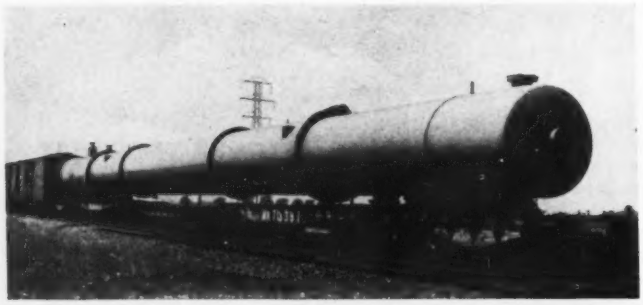
ABILITY • EXPERIENCE • RESOURCEFULNESS • RESULTS

MANUFACTURERS and MARKETS



WOOD-TREATING CYLINDER required use of five railroad flat cars to transport it to the Tama, Iowa, plant of Iowa Wood Preserving Co, subsidiary of Joslyn Manufacturing & Supply Co. The all-welded steel creosoting tank is 184 ft long and has 8-ft inside diameter. It will be used for pressure creosote treatment of wood poles, piling, and lumber. The cylinder has a pressure rating of 200 psi

Cornell, GE Establish Joint Electronics Center

General Electric Co has joined with Cornell University to establish an advanced electronics center at Ithaca, N. Y.

Purpose of the project, to be known as the General Electric Advanced Electronics Center at Cornell University, "is to carry out advanced study and development in the field of electronics, and at the same time provide scientists and engineers with teaching and educational opportunities of a type never previously established," Cornell and GE officials said.

They cited as an immediate objective of the new center an attempt to fulfill the rapidly increasing needs of industry and the armed forces for additional military electronics research and development facilities. The center will supplement GE's electronics research activities at Schenectady and Syracuse, N. Y.

During the present emergency research projects at the center may include development of control systems for guided missiles, electronic countermeasures, and infra-red systems.

Brig Gen Tom C Rivers (retired), a GE executive with headquarters at Syracuse, will be manager of the center. Another GE official, H. R. Oldfield, Jr, will be resident manager. Dr Charles R. Burrows, director of Cornell's School of Electrical Engineering, will be associate principal scientist. The name of the principal scientist has not yet been announced.

The center will occupy a laboratory on Cornell property. Modification of the building, already started, will be completed early next year.

Cornell will grant faculty appointments to a number of staff members at the center, in accordance with their qualifications. They will have full faculty privileges on the campus and may teach classes at the university.

•

Westinghouse Offers Wage Increase to 78,500

Westinghouse Electric Corp has offered wage increases ranging from 4½¢ to 10¢ an hour to 78,500 employees in union bargaining units.

The company also offered three-week vacations after 15 years of service instead of after 20 years as is the practice now.

The unions involved and the number of workers each represents are as follows: International Union of Electrical Workers, CIO, 43,000; United Electrical Workers, independent, 17,000; International Brotherhood of Electrical Workers, AFL, 5,500; and Federation of Westinghouse Independent Salaried Unions, 13,000.

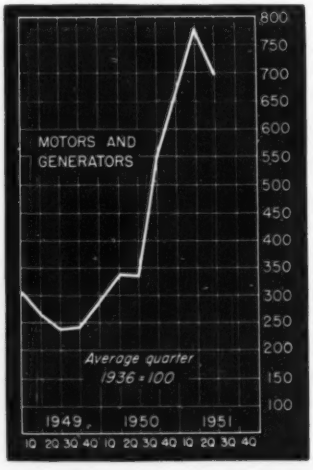
The effective date of the pay boost, if the offer is accepted by the unions, was set at Nov. 1. The company also proposed that the agreement with each union be amended to provide for a reopening period between May 1, 1952, and May 31, 1952.

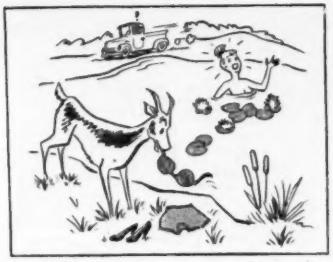
Elsewhere on the labor front the United Electrical Workers were conducting a strike vote among 50,000 General Electric Co workers at 46 plants. The union earlier rejected a company offer of a 2½% general pay rise and a cost-of-living-escalator clause. This offer was accepted by the International Union of Electrical Workers, but the rival UE termed it inadequate. UE seeks a blanket 15¢ an hour boost and a further rise of 5¢ an hour for day workers. To bolster their pay demands thousands of employees at GE's Schenectady plant staged a "token walkout" on Oct. 25.

•

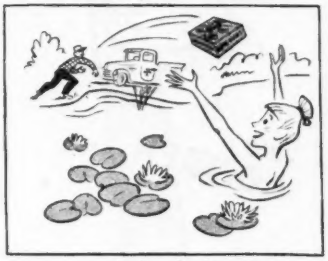
Motor, Generator Orders Drop in Second Quarter

Orders received for motors and generators fell 11% in the second quarter of 1951 after a sharp rise during the first quarter of the year.

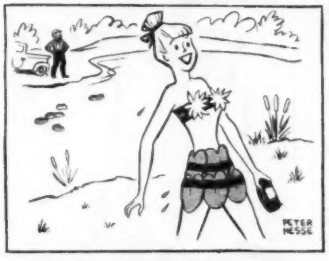




You can do a lot



with a little



GOLD SEAL TAPE

Damp or dry . . . over uneven surfaces, you can count on Gold Seal to tape up tight. It's *always* "tacky" (adhesive compound is prepared under laboratory control). A *quality* tape every foot of the way. Gold Seal *goes further* — there's no waste. Try it on your next job and see for yourself. Ask your supplier for Gold Seal Tape, made by Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.

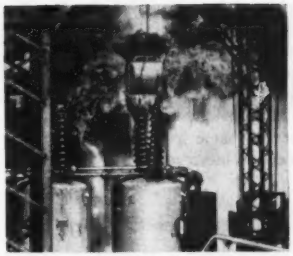
JENKINS

Gold Seal Tapes

FRICTION and RUBBER TAPES

A PRODUCT OF JENKINS BROS.

MAKERS OF FAMOUS JENKINS VALVES



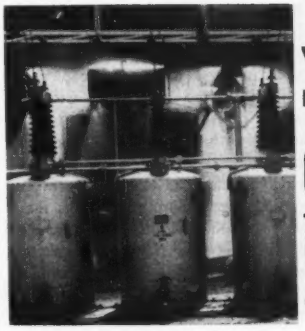
PROTECTING

flammable, oil-filled

TRANSFORMERS

with time-tested, rapid extinguishing

GRINNELL MULSIFYRE



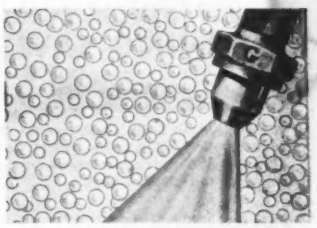
In case after case, where Grinnell MULSIFYRE has been on guard, hazardous oil fires have been effectively controlled — damage limited. For example . . .

● On August 2, 1944, a fault occurred on the 26 KV ring bus at a substation of the Public Service Electric & Gas Co., Harrison, New Jersey. Following the tripout, the operator noticed the end bay, where the transformer was located, to be ablaze. He immediately activated the electrical control operating the Grinnell MULSIFYRE System, deluging the transformer banks with water spray and extinguishing the fire.

● At a substation of the Omaha Public Power District, Omaha, Nebraska, two 25-year-old three phase 6250 KVA 13.2-2.3 KV water-cooled indoor type transformers were protected by a MULSIFYRE System automatically actuated by Quartzoid Pilot Sprinklers. On August 30, 1944 a minor explosion occurred, setting the transformer afire. The Grinnell MULSIFYRE System went into operation immediately, and there was no fire damage.

● In 1948, a lightly built wooden sawing shed was erected by the Singer Manufacturing Company, Bridgeport, Connecticut, adjacent to a bank of three 500 KVA transformers. A fire started in the shed, apparently when a carelessly discarded cigarette or match ignited sawdust, and quickly burned through the roof. The MULSIFYRE System operated over the exposed transformers, preventing damage to them.

Stop future trouble and expense. Get complete facts *now* on reliable Grinnell emulsion-forming spray systems. Write Grinnell Company, Inc., Providence, R. I. Branch offices in principal cities.



GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

WORK GOES
FASTER, EASIER
with SEYMOUR SMITH tools

The choice of tree men for generations

Center Cut Action

No. 11 Pruner Head

"TELEPHONE" TREE PRUNERS

The very finest of tree pruners! Virtually unbreakable heads, selected spruce poles with positive locking, seamless aluminum joints. Simple, powerful action. No. 11-18, 1" capacity, $16.00. No. 12-18, complete pruner 1½" capacity, with 18 foot pole, $24.00. Extension sections available.

POLE PRUNING SAW

No. 20 SAW HEAD
Head only $4.00
with 18 ft. pole $15.85

16" needle-tooth saw blade fits in 3 different positions. Extra large hook for pulling out loose branches. Paint brush holder.

LOPPING SHEARS

6 models to choose from. Cut up to 2" branches with ease.

NEW, FINEST EVER PRUNING SAWS

A new Seymour Smith development — the fastest, easiest cutters on the market. Complete line of 6 models covering all requirements up to chain saw work.

FREE: Send for full descriptive matter and prices on all Seymour Smith products for professional pruning and tree care.

SEYMOUR SMITH
OUR 102nd YEAR
The Line of Quality

SEYMOUR SMITH & SON, INC., 12411 Main St., Oakville, Conn.

The index, compiled by the National Electrical Manufacturers Association, dropped to 696 in the second quarter compared with a first quarter figure of 780. The second quarter total, however, was 106% above that for the same period a year earlier when the index read 337.

•

OPS Increases Ceilings

The Office of Price Stabilization has adjusted price ceilings of products in which lead and zinc are important raw materials to reflect the 2-cent increase in the price ceilings of these metals. Included in the price increase order are lead sheet, foil wire, pipe and other extruded, rolled, or drawn lead products with no more than 1% tin. Ceilings on lead anodes and shot and lead powder which includes 95% lead are covered by the order. Similar products made of zinc, and zinc dust and zinc base alloys of at least 90% zinc and not more than 1% tin also were included. The ceilings may be adjusted by two cents a pound for the lead and zinc content used in the products.

Metal Prices
Oct. 29, 1951

COPPER, Conn., V., lb.	$ .24½
LEAD, N. Y., lb.	.19
ZINC, prime Western, E. St. Louis, lb.	.19½
TIN, Straits, qual. N. Y., lb.	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

MANUFACTURING BRIEFS

Production of television receivers dropped 21% during the first nine months of 1951 compared with the corresponding period of 1950 and radio set output was off 5% during the period, the Radio-Television Manufacturers Association has reported. For the nine months television production amounted to 3,970,857 units compared with 5,029,200, and radio output was 10,077,478 sets against 10,638,800.

Copperweld Steel Co, Glassport, Pa., has bought all the outstanding stock of Flexo Wire Co, Inc, Oswego, N. Y. Flexo, which has been a producer of small and fine sizes of Copperweld, copper and bronze wires and cables, will be operated as a subsidiary.

We Can Make YOUR POLES LAST LONGER

AND LONGER...
AND LONGER...
AND LONGER...

WITH AN
OSMOSE
INSPECTION AND TREATING PROGRAM

This program, performed by our highly skilled crews, can save your system hundreds of thousands of dollars in REPLACEMENT COSTS by

1. Absolutely arresting groundline decay of your poles, and
2. Giving you up-to-date pole records.

Treatment charge is as low as 4% of replacement costs and pole life is extended for approximately 8-10 years. Let us send you ALL the details!

Write for Free Book

OSMOSE WOOD PRESERVING CO., INC.
1437 BAILEY AVE. BUFFALO 12, N. Y.

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Ariz., Keams Canyon—Bureau Indian Affairs, Dpt. Interior, 19 and C Sts. N.W., Wash., D. C., heating and power plant, at Keams Canyon, Hope Indian Agency.

Ark., El Dorado—Arkansas Power & Light Co., Simmons Natl. Bldg., Pine Bluff, erecting sub-station, $250,000.

California—Bureau Reclamation, Dpt. Interior, P. O. Box 570, Tracy, constr. 230-kv switchyard addns., Central Valley Proj., Tracy Switchyard.

Del., Dover—City, power plant extensions, $350,000. Albert C. Wood & Assocs., 1420 Walnut St., Phila., Pa., consult. engrs.

Fla., Eglin Field—U. S. Eng., P. O. Box 1169, Mobile, 7, Ala., airport surveillance radar facility, incl. electric plant, all utilities, roads, and extens. concrete work Eng 01-076-52-27, Plans deposit $10.

Idaho—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Mountain Home, Idaho, switch and cubicle for Anderson Ranch Power Plant, Boise Proj., Spec. DS3575. L. N. McClellan, ch. engr.

Ill., Chicago—Advance Transformer Co., 1122 W. Catalpa St., factory, Wellington and Campbell Sts. $400,000.

Ill., St. Charles—Operadio Mfg. Co., 100 N. 11 St., electronic amplifiers plant expansion and equipment, $324,500.

Ind., Decatur—City, H. Vernon Aurand, clk.-treas., Decatur, Contr. 10, generating station bldg. and appurtenant structures for municipal light and power department. $300,000. Plans deposit $10. Emery, Marker & Emery, Toledo Trust Bldg., Toledo, O., engrs.

Ind., Kokomo—Public Service of Indiana, Plainfield doubling size sub power plant, $500,000 or more.

Ind., Terre Haute—Public Service Co. of Indiana, Plainfield, power plant superstructure, $25,000,000. Sargent & Lundy, 140 S. Dearborn St., Chicago 3, Ill., engrs.

Nebraska-South Dakota—Bureau Reclamation, Dpt. Interior, Casper, Wyo., installing armor rods and attaching vibration dampers to overhead ground wires on existing Fort Randall-O'Neill and Alliance-Chadron 115 kilovolt transmission lines, Transmission Div., Missouri River Basin Proj., Spec. 703C-217.

Neb., Lincoln—General Electric Co., Electronics Div., c/o W. M. Barker, Seventh North and Hopkins Rd., Syracuse, N. Y., plant.

N. M., Los Alamos—U. S. Atomic Energy Comn., Los Alamos, 2 story bsmnt., 58,000 sq. ft. monolithic type, medical research laboratory, air-conditioning, mechanical, ventilation, etc., Inv. No. 291-52-7. $1,700,000-$2,000,000. Plans deposit $50. Physics bldg. $2,500,000-$3,000,000. Plans deposit $50.

O., Columbus—Picture Waves, Inc., LeVeque-Lincoln Tower, television center bldg. with 2 studios, on 3-acre site, at Harmon Ave. and Griggs St. Albert F. Rynan, 287 E. Broad St., archt.

Oklahoma—Southwestern Power Admin., Dpt. Interior, Felix L. Corser, Petroleum Bldg., Tulsa, switching station exten., near Brown, 138-KV Cont. ISPA-446. $60,000.

Pa., Letterkenny—U. S. Eng., 24 St. and Maryland Ave., Baltimore, Md., plans by Harris Dechant & Assoc., engrs.-archts., 123 S. Broad St., Phila. storage magazines; admin. bldg. adn.; general supply warehouse. $11,000,000.

Kan., Wichita—U. S. Eng., at office City Comn. Room, City Bldg., 204 S. Main St., air base night lighting sys., Wichita Air Force Base, Eng. 23-028-52-10, $500,-000. Bids 9/8 rejected.

S. C., Charleston—Sixth Naval Dist., Officer in Charge of Constr., Box 365, Naval Base, Charleston, furnishing, installing electrical services to deperming pier, NOY 29461.

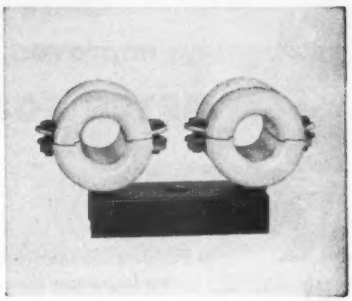
South Dakota—Bureau Reclamation,

A HANDY **POWER** WIRING DEVICE

The "Three E" CLAMP INSULATOR SUPPORT is a handy and most useful device in power wiring.

It is easy to install, economical in price and "Three E" has ample stocks to provide prompt shipment.

They are available for insulated conductors ranging from 5/16" to 3½" outside diameter, for pipe or flat mounting, single or multiple conductor.



In factories, mills, mines, power and substations, vaults etc., they make an ideal device for supporting cable runs and all open wiring.

Send for bulletin 201. It describes, illustrates and dimensions the complete line.

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

From the smallest hand operated, to the large motor operated, MURRAY Gate Hoists are designed and built in a wide range of capacities, from less than 1 ton to over 100 tons. During our over half century of designing and building gate hoists, we have developed many designs for the different types of gate hoist problems. Perhaps we have several designs and patterns that will fit your requirements. In planning gates or gate hoists, we suggest you communicate with us before your plans for the project as a whole, are complete . . . it will save expense and much preparation time. We also build gate hoists especially from your plans and specifications, if desired.

Our Engineering Department is at your service any time, to help you solve problems involving Power Dam Gates and Gate Hoists.

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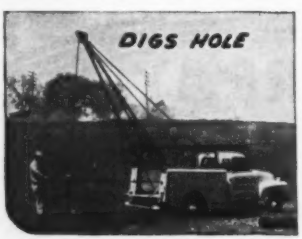
CANTON, OHIO

A subsidiary of The Union Metal Manufacturing Company



New "325" Attachment . . . Derrick and Digger Unit

For 3/4 and 1-TON TRUCKS

Why send a five man truck and crew on pole replacement or service jobs that can now be handled by two men and a highly portable ¾ or one ton service truck? The "325" attachment makes it possible for two men to set up the derrick, attach the digger, dig the hole and set the pole ready for tamping *in less than ten minutes!* This set-up, with or without radio communication, speeds up line work and cuts costs way down.

★ **No more using five-man crews on two-man jobs**

★ **Sets poles up to 35'; take augers 8" to 20" diameter**

★ **Packaged unit for installation by your local mechanic**

Write for fully illustrated Bulletin 325.

TEL-E-LECT PRODUCTS, INC.

10,003 MINNETONKA BLVD. • MINNEAPOLIS 16, MINN.

Dpt. Interior, Huron, Fort Randall-Sioux City 230 kilovolt transmission line, Transmission Div., Missouri River Basin Proj. DC 3546.

Texas—Mid-Plains Telephone Co-operative, Tulia, addnl. rural telephone pole lines, Swisher Co. $150,000.

Texas—Trunkline Gas Co., Edge, base radio stations, at Victoria, $85,000; Rosenberg, $85,000; Liberty, $85,000.

Tex., Houston—Rice Institute, c/o Dr. Wm. V. Houston, 6100 Main St., 1 story, 154,000 sq. ft. high-voltage laboratory, tower. $200,000.

Va., Danville—Dan River Mills, Danville, steam generating station addn. $2,750,000.

Virginia—B A R C Electric Co-operative, Millboro, 124 mi. rural distr. lines and sys. imprvs., Bath Co. $480,000.

Washington—Bureau Reclamation Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Eltopia, transformers for Ringgold Pumping Plant, Columbia Basin Proj., Spec. DS 3577. L. N. McClellan, ch. engr.

Wyoming—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Thermopolis, switchboard section for Thermopolis Substation, Transmission Div., Missouri River Basin Proj. Spec. DS 3576. L. N. McClellan, ch. engr.

Ont., Hamilton—Steel Co. of Canada Ltd., 7 Wilcox St., plans by A. G. McKee & Co., 2300 Chester St., Cleveland, O., U. S. A., 3 electric sub-stations mould bldg., stock bin bldg., and stripper bldg., Approx. $500,000. Alex Leischman, c/o owner, engr.

Low Bidders & Contracts Awarded

Fla., Cocoa—Ernest Waters Constr. Co., Daytona Beach, Fla., LB, $1,932,520, electrical distr. sys. for Theodolite and Camera Stations at Patrick Air Force Base, Inv. NEG-JAX-51-22. U. S. Eng., 575 Riverside Ave., Jacksonville, Fla.

Ill., Skokie—Edwin E. Hartrich & Son, 141 W. Jackson St., Chicago, 4, Ill., CA, $120,000, 1 story factory. Electric Hose & Rubber Co., 900 W. Jackson St., Chicago, 6, Ill. Awarded 10/18.

Mass., West Acton—G. B. H. Macomber Co., 19 Milk St., Boston, Mass. CA $1,000,000.—one or several factory bldgs. for mfg. WD 1 signal wire program. The Rex Corp., 51 Lansdowne St., Cambridge, Mass.

Okla., Tulsa—R. Bush Constr. Co., 3500 W. Reno St., Oklahoma City, Okla., LB, $973,676, electronic test LABORATORY, Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif. Bids Oct. 5.

Virginia—J. A. Jones Constr. Co., 209 W. 4 St., Charlotte, N. C. CA $1,101,242. Philpott Power House, Smith River, Philpott Reservoir Proj., Smith River. U. S. Eng., foot of Front St., Norfolk, Va. Bids Aug. 29.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Joliet—Caterpillar Corp., Route 6 at DesPlaines River, Joliet, Ill., 250,000 sq. ft. factory expansion, $4,000,000.

Tex., Fort Worth—Marine Aircraft Corp., c/o Eagle Mountain, Fort Worth, aircraft mfg. plant, northeast of here. $3,500,000.

Tex., Gregory—Reynolds Metal Co., 3 and Grace Sts., Richmond, Va., aluminum plant, $45,000,000. J. Gordon Turnbull, Inc., 2630 Chester St., Cleveland, O., consult. engr.

Tex., Houston—Pure Oil Co., 1st Natl. Bank Bldg. desalting refinery unit, $12,500,000; catalytic cracking refinery unit, $10,000,000.

Utah, Salt Lake City—Union Pacific R. R., W. C. Perkins, ch. engr., 1416 Dodge St., Omaha, Neb., diesel repair shop. $5,600,000.

Wash., Bellingham—Scott Paper Co., Bellingham, paper mill, $12,000,000.

Newfoundland, Corner Brook—Bowaters Newfoundland Pulp & Paper Mills Ltd., Corner Brook, plant expansion, mills, offices, wing to company hotel, diesel electric generating plant $10,000,000. Nenninger & Chenevert, 1400 St. Catherine St., West, Montreal, Que., surveyors.

BOOK REVIEWS

Servomechanisms

Servomechanisms and Regulating System Design, Vol. I. **By Harold Chestnut and Robert W. Mayer, Published by John Wiley & Sons, Inc., New York 16. 505 pages, illustrated. Price $7.75.**

This is another in the series written in the interest of the Advanced Course in Engineering of the General Electric Company and is intended for the training of design and application engineers in the principles of feedback control. It starts from the basic mathematics, describes the nature of the physical problems involved, and proceeds to the solution of advanced designs. Feedback control concept for regulators and servomechanisms are emphasized. Both the differential equation and Laplace transform methods of solving transient problems are presented. It stresses the practical approach to system synthesis; dynamic as well as static error coefficients are presented. Numerous problems are included.

Polyphase Commutator Machines

Polyphase Commutator Machines. **B. Adkins and W. J. Biggs. Published by Cambridge University Press, New York 10. 230 pages, Price $4.00**

This book, written by designers of polyphase commutator machines, is for students, and for engineers interested in their application. Primarily a practical book, it describes the most important methods of control and characteristics obtained. Theory is covered in separate sections and may be skipped by some readers. Sections cover speed and power factor regulation of induction machines, windings of polyphase commutator machines, commutation, shunt and series motors, commutator frequency changes, phase advances, and compensated motors.

Synchronous Machines

Synchronous Machines. **Charles Concordia. Published by John Wiley & Sons Inc, New York City. 220 pages, Price $5.50**

Written for a synchronous machines course given by the General Electric Co. for the last three years, the purpose of the work is to present fundamental circuit theory of transient performance of synchronous machines as used by engineers who predict machine performance.

Not intended as a reference book, although formulas for many specific cases can be found in it, this book was written to be read as a whole from the beginning. Emphasis is on rigorous mathematical development and on obtaining a fundamental physical understanding of the machine. General equations developed are applied to the calculation of transient short circuit currents and torques; steady-state power, torque, and current both in operation and starting; and the voltage disturbances occasioned by sudden application of load.

Rotating Machinery

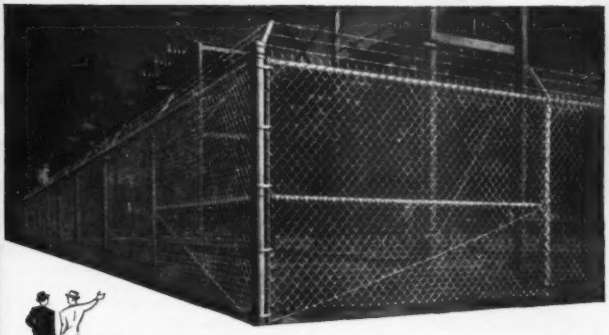
Winding Alternating Current Machines. **By Liwschitz-Garik. Published by D. Van Nostrand Company, Inc, New York. 766 pages. Price $8.50.**

Said to be the first comprehensive presentation of lap as well as wave windings, this practical book for the winder and repairman also contains new developments in integral-slot, fractional-slot, balanced and fractional slot, unbalanced lap and wave windings.

Arrangement of individual chapters is particularly effective. Each gives first the know-how, to help the reader find the answer easily to his own winding problem. This is further facilitated by detailed information on coil insulation and a series of tables that show without winding diagrams, all possible series and parallel con-

PAGE FENCE - Since 1883

• AMERICA'S FIRST WIRE FENCE •



Sabotage is a danger which calls for vigilance day and night. Property line vigilance is the job for Page Chain Link Fence, now as it has been for more than 60 years. Consult the nearby, long-experienced Page Fence engineering and erecting firm, which will submit cost estimates without obligation. Name and address will be sent with illustrated fence data on request.

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

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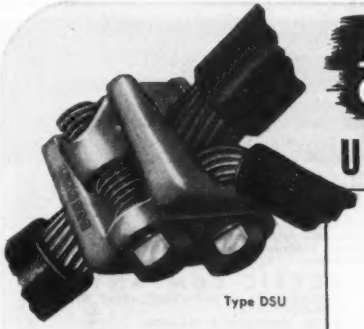

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FOR QUALITY...
DEPENDABILITY...
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AT LOW COST

DOSULON

A one-piece bolt type variable service tap. For large size copper cables. Available in conductor sizes from 1/0 to 1,000 MCM. Made of high strength copper alloy and equipped with Duronze bolts. Rugged, compact, facilitates neat taping.

WRITE FOR CATALOG 45-1

VARIABLE HERCULON CONNECTORS

For power distribution jobs. Available in eight sizes to cover range of cable No. 8 solid to 1,000 MCM.

HL-2

H2L-2

H3L-2

HC

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AVOID NIGHT ACCIDENTS . . .
35 ft. Extension Cable
TWIN LENZ
The Double Safety Light for Maintenance Equipment
A double tail light—one stationary and one that extends on 35-ft. electric cable from spring tension pulley drum.
Avoid night accidents and expensive law suits.
Mounts on rear of truck with extension sealed beam red light for coupled equipment . . . makes night flood light when extended on truck booms with red lens raised on simple bracket . . . utility extension light for breakdowns . . . extension red light for road warning.
SAE approved. Recommended by National Safety Council. Write for full particulars. Immediate Delivery.
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HARLAN MFG. CO., INC., Harlan, Iowa

"VOLT-TELLING STATISCOPE" protects worker

. . . when held in any alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

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MANUFACTURERS OF STATISCOPES, HANGERS, CLIPS, STRAPS, INSULATING AND CABLE-PULLING COMPOUND
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THE WHITAKER

An all metal, non-wobble, self-attended WIRE REEL, with automatic brake operated by outgoing wire, accurately adjustable safety pay-out, and take-up.

Sent on 10-Day Free Trial Offer

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nections for all pole numbers between 2 and 30. End of each chapter gives general rules for the layout of windings not listed in the tables. Wave windings are treated in detail for the first time. Material is also presented on multi-speed windings, single-phase windings, reconnecting windings for changed operating conditions and methods for locating faults in windings.

Electronics

Electronics. **By J. Millman and S. Seely. Published by McGraw-Hill Book Co, Inc, New York 18, N. Y. 598 pages, illustrated. Price $7.25.**

The first edition (1941) was distinctive in that the authors strove to knit together the electronic engineering and the electronic physics for better grasp of electronic functioning. This unique objective has been retained even though extensive changes have been effected to bring in newest theory and fresher material on cathode-ray tubes, cyclotrons, klystrons, and a rearrangement of the subject matter on polyphase rectifiers for power applications.

Magnetics

The Earth's Magnetism. **By Sydney Chapman. Published by John Wiley & Sons, Inc, New York 16. 127 pages, illustrated. Price $1.50.**

Data from all the world has been compiled and plotted by this Oxford professor to show the magnitude and various cyclic variations of the earth's magnetism. The hypotheses about the origin of the magnetism and the causes of the variations are presented with special stress on the "dynamo" theory and on the relationship of cycles to the sunspots.

Electronic Communications

Electromagnetic Waves and Radiating Systems. **By Edward C. Jordan. Published by Prentice Hall Inc, New York. 710 pages. Price $10.50.**

A text for electronic communication engineers and physicists on electromagnetic radiation and propagation. Early portions of the text are written at the level of seniors and beginning graduate students. Particularly thorough are the later chapters on antenna theory embracing directional and impedance characteristics, antenna practice and design, secondary sources and aperture antennas, ground and sky wave propagation.

Air Conditioning

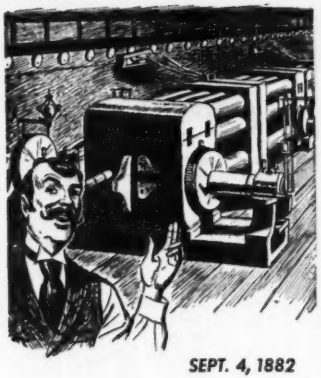
Air Conditioning in Summer and Winter. **By Richard E. Holmes. Published by McGraw-Hill Book Co, New York 18, N. Y. 352 pages. Illustrated. Price $5.75.**

Step by step explanation of the principles and methods of air conditioning and full details of construction and operation of equipment are retained in this second edition. Added is much more information on heat pumps and adsorption systems, water chillers and electrostatic air cleaners. The revision includes new chapters on reciprocating and centrifugal compressors, and low side equipment—features of panel heating systems, packaged air conditioners, and absorbent and adsorbent dehumidifiers. All procedures, tabular data, descriptions and illustrations have been brought up to date.

Mathematics

Mathematics for Engineers. **By Raymond Dull and Richard Dull. Published by McGraw-Hill Book Co, Inc, New York 18. 822 pages, illustrated. Price $7.50.**

This is a third edition (first 1926) of a book designed primarily to be a reference book rather than a text. The problems are worked out for application of the mathematical tools. The new material extends the treatment of differential equations, and adds a chapter on dimensional and similarity analysis. The latter embraces the Buckingham pi method for numerous variables.



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TECHNICAL LITERATURE

Alloy Steel Tubing—A 4-page bulletin, TDC149 offers data related to solving problems in the use of alternate grades of low carbon tubing steels. Information on microstructure, critical points, effect of alloy elements, forging, machining, welding and thermal treatment for 14 well known alloy steels used in production of tubular parts is presented. Copies are available from Babcock & Wilcox Tube Co, Beaver Falls, Pa.

Magnetic Drive—Precision Speed Control with the Adjustable-speed Magnetic Drive, a 32-page bulletin, contains complete information both on magnetic drive, and magnetic amplifier regutron speed control, and industrial applications of both. Publication 1107 is available from Electric Machinery Mfg Co, Minneapolis 13, Minn.

Electromagnets—A paper presenting design considerations and operating characteristics for a research electromagnet has been prepared by Arthur E. Little, Inc. Magnet offers field strength of over 40,000 gauss with only 20-kw power input. Copies available from Arthur D. Little, Inc, 30 Memorial Drive, Cambridge 42, Mass.

Fluorescent Lamps—Standards describing 30 types of fluorescent lamps as to lamp designation, dimensional characteristics, and starting requirements have been compiled by the A.S.A. Lamp types described include: preheat-start, instant-start, single-pin hot-cathode, bactericidal, and cold cathode electric discharge lamps. Standards available from American Standards Association, 70 East 45 St, New York 17, N. Y., at 25¢ per copy.

Cathodic Protection—A slide rule, Magnesium Anode Cathodic Protection Guide, useful in determining current outputs of magnesium anodes, anode sizes, and anode life has recently been prepared. Available from Federated Metals Division, American Smelting & Refining Co, 120 Broadway, New York 5, N. Y.

Rubber Standards—ASTM Standards On Rubber Products. This 656 page Standard presents in convenient form the 100 widely used standard and tentative test methods and specifications on rubber and rubber-like materials, and is of great value to producers and consumers of rubber products. Available at $5.00 a copy from American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

National Electric Code—The 1951 National Electric Code has recently been prepared. DeLuxe Edition includes 100-page supplement of electrical provisions of other N.F.P.A. Standards, plus an indexed advertising guide. Available at $3.00 per copy from National Fire Protection Association, 60 Batterymarch St, Boston 10, Mass.

Glass—Glass in the Design of Electrical Products describes some interesting applications of glass in the electrical industry. Also included are tables of physical and electrical properties of glass. Available from Corning Glass Works, Corning, N. Y.

Luminous Ceiling—A 34-page book with drawings, diagrams, architectural and engineering and other data has been compiled on luminous ceiling lighting with diffusing means and sound deadening. Available from the F. W. Wakefield Brass Co, Vermilion, Ohio.

NEMA Standards—Copies of new and revised standards prepared by NEMA have recently been issued. The publications

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are: (1) NEMA Standards for Brushes for Electrical Machines, CBI-1951 at $1.50; (2) NEMA Standards and Recommended Practices for Fabricating and Applying Laminated Thermosetting Decorative Sheets, LP2-1951 at $1.75; (3) NEMA Purchase Specifications for Marine-propulsion Steam Turbines and Gears, MP5-1951 at $1.50. Standards may be obtained from National Electrical Manufacturers Assoc, 155 East 44 St, New York 17, N. Y.

Machine Tolerances—"Just What Tolerances Can That Machine Meet" is the subject of a paper recently released by New York University College of Engineering. The 4-page paper describes how statistical quality control can solve the problem of whether or not a machine can meet a certain tolerance. The author, by means of a typical example, demonstrates in six steps the mathematical problem a quality control engineer would solve to get a machine in statistical control. Reprints of this paper may be had for 10¢ from Bureau of Public Information, New York University College of Engineering, New York 53, N. Y.

Electrical Conductors — ASTM standards on metallic electrical conductors has recently been made available. The compilation presents 43 ASTM standards and tentative specifications and methods of test applicable in the field. Specifications and test methods covered are copper, copper alloy, copper covered steel wire, stranded conductors, rods, bars and shapes, and pipes and tubes. Aluminum wire, galvanized steel core wire and galvanized iron wire are also covered. Specifications are included for non-ferrous metals, as well as general test methods for resistivity, tension, Rockwell hardness, and superficial hardness. This 232-page publication is obtainable from American Society of Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Equipment Protection—A 4-page bulletin describing a method for safeguarding large electrical equipment in central stations has been prepared by Minneapolis-Honeywell Regulator Co. The Brown Electronik strip chart recorder, which when coupled with a Kelvin bridge measuring circuit comprises a modern method of measuring rotor temperatures, is described. An instrumentation data sheet describes the instruments method of installation, and in addition discusses the Kelvin bridge principle. This data sheet also lists the required instrumentation, system benefits and other technical data. This literature is available from Minneapolis-Honeywell Regulator Co, Station 40, Wayne and Windrim Aves, Philadelphia 44, Pa.

Lighting—A new 16-page lighting-at-work booklet has been prepared by Westinghouse. This booklet is designed primarily for the industrial plant operator, and stresses three ways better lighting can work for him by (1) cutting costs by increased production, (2) increased efficiency, and (3) reduced accidents. Flourescent, mercury vapor and incandescent lamps are covered as to type of light, efficiency, lamp life, maintenance, mounting height, and job suitability. Special lighting for special areas is illustrated. Write to Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa for copies.

Carbon Brushes—"Carbon Brushes for Electric Equipment," a 28-page booklet, describes and illustrates fundamental considerations given to the design, application and manufacture of carbon brushes. A terminology on carbon brushes is included. This booklet is useful in familiarizing users with physical characteristics that must be known before a proper brush application can be recommended. Also presented are sections on brush types, characteristics of brush grades, brush grade recommendations, mechanical brush design and helpful hints on brush replacement. Bulletin GEA-5597 available from General Electric Co, Schenectady 5, N. Y.

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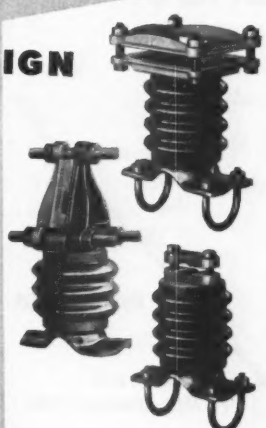

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MOTION PICTURES

Films listed are for 16 mm sound projectors and cannot be shown on silent equipment. Except as noted there is no charge for use but the borrower is usually expected to pay transportation charges one or both ways and insurance against loss or damage to the pictures.

The Shape of Things to Come (30 minutes)—A color presentation of the advantages of designing products around extruded aluminum parts, supplemented by actual pictures of how such parts are fabricated for service in building products, bridge railings, pipe lines, etc.

Animation is used to how extrusions produces a complicated shape, and after sawing produces a part ready for use.

The "on location" sequences in some twenty manufacturing plants required over 13,000 miles of traveling.
Reynolds Metals Co, 2500 South Third St, Louisville 1, Ky.

What You Should Know to Put on a Show

Set up before the audience arrives:

1. Arrange seating
2. Mount projector on sturdy table
3. Arrange speaker and power cables
4. Test projector for sound
5. Thread film and test by hand
6. Focus picture and adjust sound volume
7. Assign someone to turn lights off

Watch your equipment during the show:

1. Make frequent checks during the running of the picture to see that film is passing through your equipment properly
2. Maintain constant check on sound level during show
3. Keep spare exciter and projector lamps on hand
4. When film reaches "The End" turn on room lights, turn off projector lamp, and turn sound volume down

How to Braze Aluminum (7 minutes)—The process of joining thin aluminum sections by means of brazing is discussed in this picture. Furnace brazing, dip brazing, and torch brazing are illustrated. The importance of preparing aluminum surfaces prior to the brazing process is shown, with examples of solvent cleaners, vapor degreasers, and chemical cleaners.
Aluminum Co of America, 818 Gulf Building, Pittsburgh 19, Pa.

Selecting the Right Industrial Distribution System (20 minutes)—This color film presents factual data to assist in interpreting plant distribution problems. In animation this film describes in detail, the major basic distribution systems commonly used, and the advantages and disadvantages of each.
Westinghouse Electric Corp, 511 Wood St, Pittsburgh 30, Pa.

Silicones (10 minutes)—The thirteenth in General Electric's Excursions in Science series, this film explores a brand new field of chemistry—the Science of Silicones.

Silicones are shown to be new compounds not unlike hydrocarbons in structure, except that the carbon atom is replaced by a silicon atom. Starting with coal, and sand, the film shows very simply why the two "families" have such strikingly different characteristics.
General Electric Co, Schenectady, N. Y.

U.S.S. Cor-Ten (20 minutes)—The commercial story of the development of an exceptional type of high-strength steel which has effected savings in the weight of transportation equipment and in reduced maintenance costs of such equipment.
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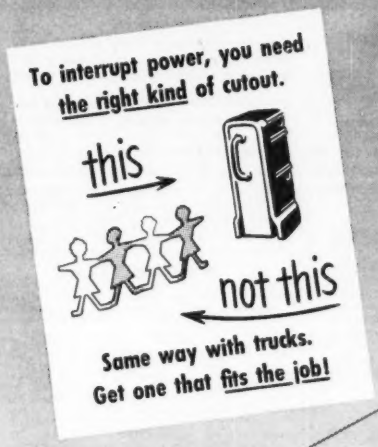
"Job-Rated" TRUCKS



Want to insulate your utility business against high hauling costs? Of course, you do! Then get a truck that fits your job . . . a Dodge "*Job-Rated*" truck!

Whether you're putting up poles, lugging cable, or hauling men and equipment . . . you'll find Dodge trucks keep gas, oil and maintenance costs at low, low level the year 'round! Take the Dodge Power-Wagon, for example. Its rugged 94-H.P. engine gives you plenty of get-up-and-go for your toughest on- and off-the-road trips—yet squeezes a whale of a lot of mileage from every gallon of gas.

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Why not get the lowdown firsthand from your nearby Dodge dealer?

"Job-Rated" TRUCKS DO THE MOST FOR YOU

How a Dodge Truck is "*Job-Rated*" for the Utility Business

A Dodge "*Job-Rated*" truck is engineered *at the factory* to provide the best in low-cost transportation . . . last longer . . . save you money.

Every unit from engine to rear axle is "*Job-Rated*"—factory-engineered to haul a specific load.

Every load-CARRYING unit—frame, axles, springs, wheels, tires and others — is engineered to provide the strength and capacity necessary to *support* the load.

Every load-MOVING unit—engine, clutch, transmission, propeller shaft, rear axle, and others—is engineered to *move* the load under the most severe conditions.

From a wide range of models, you can select a truck that meets your needs.

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$1.20 a line, minimum 3 lines.
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AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by Nov. 1st in the N. Y. C. office will appear in the Nov. 19th issue subject to limitation of space available.

ELECTRICAL
Chief Engineer

Chief Electrical Engineer, capable of supervising large electrical design division, required for permanent position in large industrial engineering firm located in the Midwest. Must be fully experienced technically, as well as administratively.

Submit complete record stating experience, education, salary required and availability. Interviews arranged with qualified applicants. All replies confidential.

P-2307, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

GRADUATE
MECHANICAL ENGINEER

—to plan and supervise mechanical plant betterment and maintenance in new high pressure steam electric generating stations in South Central United States. Desired to have three or more years experience in design, construction, or maintenance of modern high pressure steam electric generating plants. Ample opportunity for advancement due to continuing program of plant expansion. Preferred age 30 to 45.

Please supply pertinent data to:

P-2016, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED: Experienced Power Station Engineer.
POSITION: Assistant to Manager of Power Production with administrative responsibility of operating central stations totaling approximately 800,000 kw.
LOCATION: Pennsylvania.
ADVANCEMENT: Excellent for growth on job and promotion in near future.
EXPERIENCE: 10 years minimum, with at least 5 years in operation, maintenance or efficiency work in large modern steam-electric central station. Construction and design experience will be considered.
EDUCATION: B.S. degree in Mechanical (preferred) or Electrical Engineering from an accredited engineering college.
AGE: 30-45.

Salary commensurate with qualifications

All applications will be acknowledged. Please send personal record to

P-2130, Electrical World
330 W. 42 St., New York 18, N. Y.

WANTED
SALESMAN or AGENCY

Experienced in sale of power and distribution transformers for Chicago district

BW-1778, Electrical World
330 West 42nd St., New York, N. Y.

GRADUATE
ELECTRICAL ENGINEER

—to plan and supervise electrical plant betterment and maintenance in new high pressure steam electric generating stations. Desired to have three or more years experience in electrical design, construction, or maintenance of modern high pressure steam electric generating stations. Ample opportunity for advancement due to continuing program of plant expansion. Preferred age 30 to 45.

Please supply pertinent data to:

P-2015, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

SUPERINTENDENT

—for modern new high pressure 70,000 KW steam electric generating station in South Central United States. Must be graduate Mechanical Engineer with adequate experience and qualifications to immediately assume complete supervision of plant operation and maintenance. Good working conditions and ample opportunity for advancement due to continuing expansion of generating capacity. Preferred age 35 to 45.

Please supply pertinent data in letter to:

P-2013, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWERPLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ELECTRICAL DESIGN engineer, recent graduate, experience not necessary, for small, well established manufacturer of transformers. P-2368, Electrical World.

ELECTRICAL ENGINEER—For research and development work in New York firm. Minimum requirement M.S. in E.E. or equivalent. Investigatory work on low voltage switchgear, circuit breakers and related equipment. Salary open. P-2324, Electrical World.

ELECTRICAL HEATING Specialist. Opportunity with stable, mid-western utility situated in thriving industrial area. Require experience in promoting application of electrical heating in industrial plants. No traveling. Salary commensurate with ability. Submit resume of education, experience and personal data to P-2282, Electrical World, 520 N. Michigan Avenue, Chicago, Illinois.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL, $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. I., 241 Orange St., New Haven, Conn.

POSITION WANTED

MAINTENANCE OR Construction Superintendent. Twenty-seven years experience industrial plants, transmission and distribution lines, substations, power houses, underground systems. Capable of organizing and handling complete electrical department. Employed, desire change. Willing to travel, domestic or foreign service. PW-2284, Electrical World.

PART TIME WORK WANTED

ELECTRICAL ENGINEER, 25 years experience, desires home work: Electrical calculations, design, estimates on hourly or contract basis. PTWW-2362, Electrical World.

ELECTRICAL ENGINEER wants free lance translation work from German, French or Russian into English. PTWW-2361, Electrical World.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3571) will be received by the Bureau of Reclamation, Denver, Colorado, until November 27, 1951, and then publicly opened for furnishing a 20,400-kvar, outdoor power capacitor equipment bank, suitable for use on 14,400-volt, 3-phase circuit; one 14.4-kv, 2,000-ampere, 1,500,000-kva, outdoor, power circuit breaker; eighteen 15-kv, 2,000-ampere, single-pole, outdoor disconnecting switches; and 3 single-pole 14.4-kv, outdoor lightning arresters for Tucson Substation, Davis Dam Project, Arizona-Nevada. Delivery is desired within 180 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	7500	G. E.	138000—41000, 3 ph.
3	3333	West.	132000—7620/13200 Y
3	500	G. E.	66000—2400
4	2500	West.	44000—11000
3	1500	Wag.	44000—6900 NEW
3	200	Moi.	44000/22000—440/220
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
6	1500	Pitts.	33000—2400
3	200	West.	33000—7200/12470 Y
4	150	G. E.	33000—7200/12470 Y
3	100	A. C.	33000—7200/12470 Y
3	75	Moi.	33000—2300/6900
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000 Y
4	450	A. C.	25410/44000—13280/23000
3	350	West.	22000—2300
2	667	Pitts.	13200—2300
3	200	Moi.	11000—2300
3	150	Moi.	7620/13200 Y—120/240
3	667	Kuhl.	7200/12470 Y—2400
3	100	West.	7200/12470 Y—2300
3	75	West.	6600—460/230
1	100	G. E.	2300—575, 3 ph.

INDUCTION REGULATORS

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2—120 KVA G. E. 500/1000 A. 2400 V. O/D
2— 46 KVA West. 200/400 A. 2300 V.
6— 36 KVA G. E. 150 A. 2400 V.
2— 36 KVA G. E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

4—600 A. 154 KV G. E. FHKO- 39-2500 MVA
1—600 A. 73 KV G. E. FHKO-236- 500 MVA
1—400 A. 37 KV G. E. FHKO-136- 350 MVA
1—400 A. 37 KV West. 0-221-500 MVA
1—400 A. 15 KV G. E. FKO-37-40 #
4—600 A. 15 KV G. E. FHKO-139-750 MVA

BREW, WOLTMAN & CO., INC.
52 Church Street New York 7, N. Y.

TRANSFORMERS
FOR SALE

1 Phase, 60 Cycle

5—500 KVA G-E 66000—2300
2—500 KVA W-H 13200—240/480
3—400 KVA W-H 13200—600/575/550
5—333 KVA 44000—8800
3—250 KVA W-H 13800—2300
3—200 KVA G-E 13200—120/240
3—150 KVA 44000/33000—2400/500
3—100 KVA G-E 33000—6900/11950Y
3— 50 KVA A-Ch 33000—2400/4160Y

3-Phase, 60 Cycle

2— 750 KVA W-H 13800—480 DRY
1—4000 KVA W-H 15000/12750 Auto

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
CINCINNATI 27, OHIO

NEW
Guaranteed Rebuilt
MOTORS-GENERATORS-CONTROLS
NOW IN STOCK
We buy surplus equipment
L.J. LAND Inc.
Reading

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	6000	Al. Ch.	Condensing 200/250 LS.P. 2300 v. 3/60 Exc. & Surface Cond.
2	750	G.E.	Condensing — 425 lbs. 750 TT. I.S.P. 440V. 3 ph. 60 cy.— Built 1944
1	400	Westg.	Non-condensing — 13 1/150 lbs. I.S.P. 5/10 lbs. B.P.— 240/480 v. 3 ph. 60 cy.
1	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

	KVA	Make	Type	Volts	Speed
1	5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS
3 ph. 60 cy.

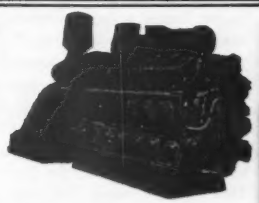
Qu	KW	Make	Speed	DC Volts	AC Volts
2	2000	G.E.	500	600 25 cy.	11000
1	1500	G.E.	720	600	13200
1	1500	G.E.	360	275	2300/4400
1	1000	Whse.	900	600	6150
1	1000	G.E.	900	250	4100/6900
1	750	Whse.	900	275	2300/4150
2	500	Whse.	900	250	6600/13200
1	500	Whse.	1200	125/250	2300
1	500	G.E.	900	600	2300/4000
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300
1	400	G.E.	720	125	440/2300
1	350	G.E.	900	125	4150
1	340	G.E.	1200	250	2300

TRANSFORMERS—60 Cycle

	KVA	Make	Type	Ph	Voltages
1	4000	G.E.	HT	3	22000x2300
3	1500	Pitts.	OISC	1	22000/2300
3	1250	G.E.	HVDDJ	1	6600x440
3	500	A.C.	OISC	1	13200/2300
6	300	G.E.	HT	3	2400x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

DIESEL POWER
FOR
IMMEDIATE SHIPMENT
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	32F16	2000	300	275	Enterprise	DSG-6	450	450
1430	Fairbanks Morse	38D8⅛	1600	720	230	Superior	ENA	300	514
1250	General Motors	16-278A	1600	720	212	General Motors	3-268A	450	1200
937.5	General Motors	12-567	1080	720	212	Clark	MD-4	375	327
625	Alco	6-12¼x13T	750	600	125	Ingersoll Rand	8	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6046O	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINEERS DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.
ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—2500 KVA Whse., 3 Ph., 34, 300/99.750-480V
3—1500 KVA Pittsburgh, 1 Ph., 22,000-2300V
1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2— 400 KVA Pittsburgh, 1 Ph., 2400/4800-240/480 Sect-Type
3— 400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1— 200 KVA G.E., 3 Ph., 2400V 220 Sec.
1— 200 KVA Whse., 1 Ph., 2400-480V
10 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.

SYNCHRONOUS MOTORS

1— 300 H.P. Elec. Mach. 720 RPM, 3 Phase 60 cy., 2200V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4600V Syn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V. Sec.
1—175 KVA Westl., 1 Ph. 220V, Motor 3 Ph. 460V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 100 KW, Allis-Chalmers, 125/250V, 900 R.P.M., 480V Sec.

SLIP RING MOTORS

1—2500 HP G.E., MT. 257 RPM, 6600V.
1— 250 HP Westl., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2300V with D.C. Exc.

Large Stock of A.C. and D.C. Equipment

If there is
Anything you want . . .
that other readers of this paper can supply
Or—
Something you don't want
that other readers can use, advertise it in the
SEARCHLIGHT SECTION

DIESELS—FOR SALE

2—1250 HP, 4 cycle, 164 RPM Macintosh-Seymour diesel engines driving 850 KW, 2 phase, 2300 volt, 60 cycle generators (can be rewound 3 phase). Units now in Central Station operation, probably available May 1952. Contact Commissioner of Public Utilities, Rockville Centre, N. Y.

MOTORS, GENERATORS, TRANSFORMERS
1 — 1500 H.P.
Bought and Sold
New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER

LETTERS TO THE EDITOR

Higher Feeder Voltages

To the Editor:

I am a constant reader of your "Technical Notes," and also read with interest on your masthead page about how you dig them up.

I am wondering if you . . . are open to a suggestion by an outsider.

My suggestion is: "Copper shortage should be immediately reflected in higher feeder voltages where design is now in drawing board stage."

Power Plant and Industrial Power Designers have grown accustomed to doing things the easy way. In a power plant this means dropping a 13.8-kv feeder from the main switchgear down to a power center on the floor below. This means heavy 440-volt feeders 200 ft or longer to the motor control centers for the station auxiliary pumps, etc. To conserve copper, the station service transformers could be located at the motor control centers, and the heavy 440-volt feeders eliminated.

Due to the usual congestion in the area around the motor control centers, some ingenuity would be required to find room for the transformers. And this is bad because designers hate to have to use their brains too much. They like to walk in trodden paths. I can say that because I am one myself or, at least, I am an engineer who supervises designers. And I would have to use the ingenuity.

A similar saving in copper could be effected in new industrial plants by placing the high voltage transformers near the load centers. This is, of course, the modern trend but it is far from being universally followed.

Frank E. Reeves
Electrical Instructions
Baton Rouge 6, La.

Industrial Lighting

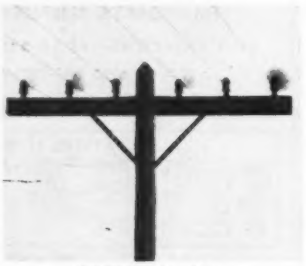
To the Editor:

Commendations for the fine article on better industrial lighting published in Electrical World, August 13, 1951. It is the most sound approach to the problems of industrial lighting that I have read. I would be interested in knowing the author.

L. E. Tayler
Senior Engineer
Lighting Division
The Detroit Edison Co.
2000 Second Avenue
Detroit

Editor's Note: The editor who produced the industrial lighting article is Frank Innes.

Air-Borne Weeds?



"FUZZY" insulators

To the Editor:

The enclosed photo could be static or it could be Nebraska weeds blown up on the line and down the wire to the insulator.

Bruce B. Watts
1445 Nemaha Street
Lincoln, Neb.

More on Light and Life

To the Editor:

Following publication of the piece "Light on Light and Life," I received the following communication from Mr. J. C. Forbes of our New York office:

"Let me congratulate you on the ingenious device you have found and made use of for getting your name in print but yet not getting it in print—at least the legal responsibility part of it. The comments attributed to you that appear in the October 8, 1951 issue of Electrical World sound just like you even to the Editor's note."

I put the matter in the hands of my combination publicity and legal adviser, Mr. J. L. Tugman, who replied to Mr. Forbes in these terms:

"Mr. J. P. Ditchman has asked me for advice with reference to your letter of October 9 which makes mention of "legal responsibility."

"The matter to which you refer, viz, an article in Electrical World, was one in which I represented Mr. Ditchman. My client is accustomed to receiving many opportunities for authorship. Many editors are anxious to interpret his ideas to their readers. Under these circumstances, I have often advised cooperation to the extent of permission to attribute Mr. D as inspiration. In the present case, I can assure you moral and aesthetic responsibility is accepted since Mr. Innes, associate editor of the magazine, who wrote the piece in question, did first propose Mr. D as author. After study and negotiation, the version which appeared in the October 8 issue of Electrical World was approved for the manner of publication in which it was presented. My client wishes me to thank you for your congratulations . . . which Mr. Innes' distinguished writing has evoked."

I offer this correspondence for publication to prove to Mr. Forbes and to any others who may suspect me of literary pusillanimity, that I am not afraid of the responsibility of authorship. In evidence thereof, I sign this letter, which Mr. Innes wrote for me.

J. P. Ditchman
Lamp Division
General Electric Co
Cleveland, Ohio

In the next issue . . .

How to Locate and Stop TV Interference

A listing of the characteristics, causes, and cures for TV interference and a discussion of methods and equipment for spotting intereference sources

They go together

Nicopress TOOLS
Nicopress SLEEVES

Together they make the Perfect Splice

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

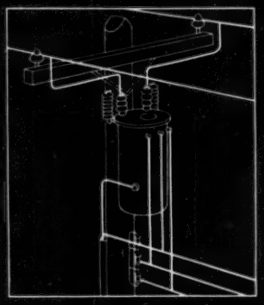
Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

IT'S A FACT:

A KUHLMAN "CSP" TRANSFORMER COSTS NO MORE THAN A CONVENTIONAL TYPE EQUIPPED WITH PROTECTIVE DEVICES!

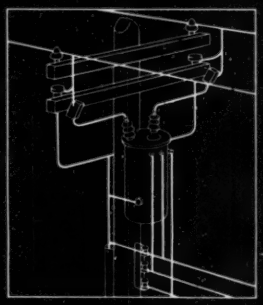
since you can get this ➧



"CSP" TRANSFORMER

Installed in one package on the pole. Nothing extra to buy; nothing extra to install.

why get this ➧



CONVENTIONAL

Requires installation of arresters, fuses and extra crossarm for complete protection.

Actually, you save money! Why go to the expense of buying a conventional transformer and equipping it with arresters and cutouts when you can buy a completely self-protected Kuhlman CSP* Transformer with all protective equipment built in? With no extra equipment to install, the Kuhlman CSP* Transformer naturally costs less to mount on the pole!

It costs less to operate, too, because it eliminates cost of fuse and cutout replacements, reduces burnouts and makes costly load surveys unnecessary. Customer service is improved since the secondary breaker safely permits overloads which would be dropped by the cutout fuse of a conventional transformer.

These are vital figures for the electric light and power industry because cutting distribution costs is more important today than ever before. Write for complete information on Kuhlman CSP single and three phase transformers — ask for Bulletins CS-301 and 303.

*TRADEMARK—REG. U.S. PAT. OFF.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

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